PRINTED-WIRING BOARD AND ITS MANUFACTURING METHOD

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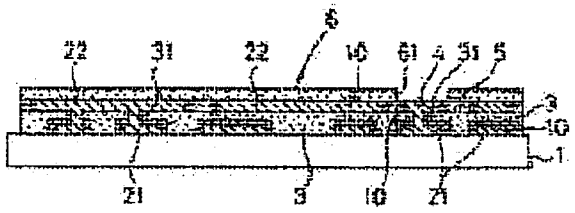
Abstract of **JP 9219588 (A)**

PROBLEM TO BE SOLVED: To provide a printed-wiring board and its manufacturing method without narrowing the effective area of the land for surface packaging part provided on the topmost surface side making said land hardly releasable. SOLUTION: This printed-wiring board is provided with a plurarity of wiring layers through the intermediary of an insulating layer 3 on an electric insulating substrate 1, a topmost wiring layer 22 covered with a surface protecting layer 6 and the surface exposed land 4 for surface packaged part formed by electrolytic plating step.; In such a constitution, an electric insulating land holding layer 5 is provided along the outer peripheral edge of the land 4 for surface packaging part and closely adhering thereto for setting up the surface of this land holding layer 5 so as to compose almost the same surface as that of the land for surface packaging part or protruding upward. Furthermore, even if any external force is given to said land 4 in the releasing direction thereof, the release can be avoided by the action of the land holding layer 5.



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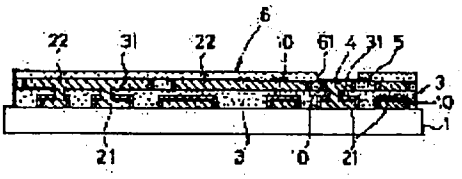
(54) PRINTED-WIRING BOARD AND ITS MANUFACTURING METHOD

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a printed-wiring board and its manufacturing method without narrowing the effective area of the land for surface packaging part provided on the topmost surface side making said land hardly releasable.
SOLUTION: This printed-wiring board is provided with a plurarity of wiring layers through the intermediary of an insulating layer 3 on an electric insulating substrate 1, a topmost wiring layer 22 covered with a surface protecting layer 6 and the surface exposed land 4 for surface packaged part formed by electrolytic plating step. In such a constitution, an electric insulating land holding layer 5 is provided along the outer peripheral edge of the land 4 for surface packaging part and closely adhering thereto for setting up the surface of this land holding layer 5 so as to compose almost the same surface as that of the land for surface packaging part or protruding upward. Furthermore, even if any external force is given to said land 4 in the releasing direction thereof, the release can be avoided by the action of the land holding layer 5.



* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1]Each wiring layer arranged at the upper part and bottom via a BAIA hole which has two or more wiring layers and insulating layers which were accumulated by turns on an electrical insulating substrate, and was established in an insulating layer is connected, and. It has a land for surface mounted devices exposed to the outermost surface side from the best wiring layer covered with a surface protection layer, and a surface protection layer, And in a printed wired board in which each wiring layer and a land for surface mounted devices after a two-layer eye are formed of electrolytic plating at least, Cover a periphery edge of the above-mentioned land for surface mounted devices, make it stick to the side, and an electric insulation land holding layer is provided, And a printed wired board setting up this land holding layer's upper surface constitute the upper surface and an approximately same flat surface of a land for surface mounted devices, or project from the upper surface of the above-mentioned land for surface mounted devices to the upper part side.
[Claim 2]The printed wired board according to claim 1, wherein a surface treatment which raises adhesion with an electric insulation land holding layer on the side of the above-mentioned land for surface mounted devices is performed.
[Claim 3]The printed wired board according to claim 2 being the detailed surfacing processing whose above-mentioned surface treatment the above-mentioned land for surface mounted devices is constituted by copper, and follows blackening treatment or this blackening treatment.
[Claim 4]A process of forming a conductor layer by an electrolytic plating method, patternizing this, and forming the best wiring layer and a land for surface mounted devices on an insulating layer before the best wiring layer is formed in a manufacturing method of the printed wired board according to claim 1, An electric insulation resin layer is covered all over the above-mentioned best wiring layer and a land for surface mounted devices being included, And a manufacturing method of a printed wired board possessing a process of buffing removing a part corresponding to a land for surface mounted devices of an electric insulation resin layer at least, and forming an electric insulation land holding layer.
[Claim 5]A process of forming a conductor layer by an electrolytic plating method, patternizing this, and forming the best wiring layer and a land for surface mounted devices on an insulating layer before the best wiring layer is formed in a manufacturing method of the printed wired board according to claim 2, A process of performing a surface treatment which raises adhesion with an electric insulation land holding layer of the formed above-mentioned land for surface mounted devices who forms at the following process to the side at least, An electric insulation resin layer is covered all over the above-mentioned best wiring layer and a land for surface mounted devices being included, And a manufacturing method of a printed wired board possessing a process of buffing removing a part corresponding to a land for surface mounted devices of an electric insulation resin layer at least, and forming an electric insulation land holding layer.
[Claim 6]A manufacturing method of a printed wired board, wherein a means to patternize the above-mentioned conductor layer and to form the best wiring layer and a land for surface mounted devices in a manufacturing method of the printed wired board according to claim 4 or 5 is constituted by the photolithographic method using photosensitive resist.
[Claim 7]an electric insulation resin layer in a manufacturing method of the printed wired board according to claim 6 all over the best wiring layers, such as this, and a land for surface mounted devices being included while the patternized best wiring layer and a photosensitive resist layer on a

land for surface mounted devices had been made to remain, [cover and] A manufacturing method of a printed wired board carrying out buffing of the part corresponding to a land for surface mounted devices of an electric insulation resin layer, and removing it at least.
[Claim 8]In a manufacturing method of the printed wired board according to claim 6, the patternized best wiring layer and a photosensitive resist layer which remains on a land for surface mounted devices are removed, After performing a surface treatment all over the exposed best wiring layer and a land for surface mounted devices, Cover an electric insulation resin layer all over a land for surface mounted devices and the best wiring layer to which a surface treatment was performed, which formed a photosensitive resist layer on the above-mentioned land for surface mounted devices at least and in which this photosensitive resist layer was formed being included, and. A manufacturing method of a printed wired board carrying out buffing of the part corresponding to a land for surface mounted devices of an electric insulation resin layer, and removing it at least.
[Claim 9]A manufacturing method of the printed wired board according to any one of claims 5 to 8 being the detailed surfacing processing to which the above-mentioned land for surface mounted devices is constituted by copper, and the above-mentioned surface treatment follows blackening treatment or this blackening treatment.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the printed wired board manufactured by the build-up method, and its manufacturing method, It is related with improvement and the manufacturing method of the printed wired board to which exfoliation of the land for surface mounted devices (land for carrying a semiconductor chip and connecting since a surface mounted device is carried) especially provided in the outermost surface side does not take place easily.
[0002]
[Description of the Prior Art]the wiring layer and electrical insulation layer to which the build-up method comprises a conductor on an electrical insulating substrate — alternation — and it is the method of laminating repeatedly and manufacturing a printed wired board, and has an advantage which can form the wiring layer of a minute pattern.
[0003]And it is divided roughly into this build-up method by a fully-additive process, a semiadditive process, and the subtractive process in accordance with the method of forming a wiring layer.
[0004]First, the above-mentioned fully-additive process forms the photosensitive resin layer b on the electrical insulating substrate a in which the adhesives layer p was formed as shown in drawing 7 (refer to drawing 7 A), It is the method of exposing and developing this photosensitive resin layer b selectively, and forming permanent-resist-layers b' (refer to drawing 7 B), and making the part exposed from these permanent-resist-layers b' form a conductor selectively, and forming the wiring layer c in it (refer to drawing 7 C). The photopolymer b is formed via the following adhesives layer (not shown) on the formed wiring layer c and above-mentioned permanent-resist-layers b', membrane formation of exposure and development, and the above-mentioned conductor is repeated, and the wiring layer c of multilayer structure is formed (refer to drawing 7 D).
[0005]However, since the above-mentioned electrical insulating substrate a surface is covered with the adhesives layer p in this fully-additive process, Electrolytic plating cannot be used as the technique of making the part exposed from permanent-resist-layers b' form a conductor, It has the problem that the membraneous quality of the conductor which physical vapor phase growth, electroless deposition methods, etc., such as vacuum deposition, were only used, and the membrane formation speed is accompanied by the restrictions late and big.to thickness and conductivity, and was formed is also weak.
[0006]On the other hand, since the semiadditive process and subtractive process which are described below can apply an electrolytic plating method as formation methods of the above-mentioned wiring layer, it becomes possible to excel in conductivity with a thick film, and to form easily the precise wiring layer which is not weak.
[0007]Namely, the above-mentioned semiadditive process forms the conductor layer c1 of a thin film by methods, such as an electroless deposition method, all over the electrical insulating substrate a, as shown in drawing 8 (A), Mask layer b which provided the photosensitive resin layer uniformly on this conductor layer c1, and was patternized by exposure and development and in which the wiring layer formation part carried out the opening is formed. Next, the wiring layer c2 of a thick film is formed by an electrolytic plating method on the conductor layer c1 exposed from the opening of this mask layer b, And the solder layer d is formed only on this wiring layer c2, and (refer to drawing 8 B) mask layer b which remains on the conductor layer c1 is removed, and the conductor layer c1 of that part is exposed (refer to drawing 8 C). Next, it is the method of removing the conductor layer c1 which makes

the above-mentioned solder layer d etching resist, and is exposed from this solder layer d, and forming the wiring layer c (refer to drawing 8 D). Subsequently, form the electric insulation resin layer e all over the electrical insulating substrate a in which the wiring layer c of the lowest part was formed, and establish the BAIA hole e1 in this part, and. As from formation of the above-mentioned conductor layer c1 to the formation process of a wiring layer is repeatedly shown in drawing 8 (E), the best wiring layer c and the land c3 for surface mounted devices mentioned above are formed in the outermost surface side (this example comprises a two-layer wiring layer). And finally the photosensitive solder resist f used as a surface protection layer is uniformly formed in the whole surface having contained the best wiring layer c and the land c3 for surface mounted devices (refer to drawing 8 F), And this resist f is patterned, the opening only of the part corresponding to the land c3 for surface mounted devices is carried out, and the best wiring layer c etc. obtain the printed wired board covered with the surface protection layer g (refer to drawing 8 G).

[0008]Although a photopolymer can also be used as the above-mentioned electric insulation resin layer e in this semiadditive process, it is possible to use not only this but arbitrary electric insulation resin. And when the electric insulation resin e has photosensitivity, this can be exposed and developed and the above-mentioned BAIA hole e1 can be formed. What is necessary is to irradiate with laser beams etc. and just to remove electric insulation resin corresponding to the formation part of the above-mentioned BAIA hole e1, when there is no photosensitivity in electric insulation resin.

[0009]On the other hand, as shown in drawing 9, the above-mentioned subtractive process forms the conductive layer (not shown) of a thin film by an electroless deposition method all over the electrical insulating substrate a, and forms conductor layer c' of a thick film by an electrolytic plating method on a conductive layer, and. A photosensitive resin layer is uniformly provided on this conductor layer c', and it patternizes by exposure and development, and mask layer b is formed (refer to drawing 9 A). Next, it is the method (refer to drawing 9 C) of removing conductor layer c' and the conductive layer which are exposed from above-mentioned mask layer b by etching (refer to drawing 9 B), and removing mask layer b which remains, and forming the wiring layer c. Subsequently, form the electric insulation resin layer e all over the electrical insulating substrate a in which the wiring layer c of the lowest part was formed, and establish the BAIA hole e1 in this part, and. As from formation of above-mentioned conductor layer c' to the formation process of a wiring layer is repeatedly shown in drawing 9 (D), the best wiring layer c and the land c3 for surface mounted devices are formed in the outermost surface side. And finally the photosensitive solder resist f used as a surface protection layer is uniformly formed in the whole surface having contained the best wiring layer c and the land c3 for surface mounted devices (refer to drawing 9 E), And this resist f is patterned, the opening only of the part corresponding to the land c3 for surface mounted devices is carried out, and the best wiring layer c etc. obtain the printed wired board covered with the surface protection layer g (refer to drawing 9 F).

[0010]Any of what has photosensitivity as the electric insulation resin e, and resin without photosensitivity can also be applied, and the formation process of a BAIA hole is the same as that of the case of a semiadditive process. In this subtractive process, when the one side metallic foil laminate sheet etc. with which metallic foils, such as copper, were stuck as the above-mentioned electrical insulating substrate are applied, the conductor layer which constitutes each wiring layer after a two-layer eye at least will be formed by a metal plating method.

[0011]

[Problem(s) to be Solved by the Invention]Thus, since it excels in conductivity with a thick film and a semiadditive process and the subtractive process can form easily the precise wiring layer which is not weak compared with the fully-additive process mentioned above, they have an advantage from which the printed wired board excellent in the electrical property is obtained.

[0012]However, when the surface protection layer g which only the above-mentioned land c3 for surface mounted devices exposes as shown in drawing 8 (F) - drawing 8 (G) and drawing 9 (E) - drawing 8 (F) is formed, Since it is necessary to set up more greatly the opening h size of the surface protection layer g a little from the area of the land c3 for surface mounted devices, taking the error of the pattern processing accuracy of the photosensitive solder resist f into consideration, between the opening edge of the above-mentioned opening h, and the land c3 for surface mounted devices, a crevice will arise inevitably.

[0013]Thus, since a crevice arises between the land c3 for surface mounted devices, and the opening edge of the surface protection layer g and this etc. are not connected to it, When external force was added in accordance with the direction of the surface of a printed wired board by a certain cause,

there was a problem that the above-mentioned land c3 for surface mounted devices exfoliated easily by operation of this external force.
[0014]There was a problem of the adhesion power being weak since the above-mentioned land c3 for surface mounted devices is only stuck to the printed wired board on the bottom, and being easy to exfoliate when the power pulled up perpendicularly acts.
[0015]When an electrical part was especially removed from the reasons of product maintenance etc., there was a problem of being easy to exfoliate in order that external force and raising power which were mentioned above may act on the land c3 for surface mounted devices.
[0016]It is possible to avoid exfoliation of the above-mentioned land for surface mounted devices by taking the composition that the opening h size of the above-mentioned surface protection layer g is set up more smallish than the area of the land c3 for surface mounted devices, and a part of periphery edge of the land c3 for surface mounted devices is covered with the surface protection layer g. However, since a part of land for surface mounted devices is covered with a surface protection layer when such composition is taken, It has another problem the exposure area of that part and the land for surface mounted devices becomes small, and it becomes complicated working [which carries a surface mounted device, a semiconductor chip, etc. on this land for surface mounted devices].
[0017]This invention was made paying attention to such a problem, and there is a place made into the technical problem in providing and doubling the printed wired board to which the exfoliation does not take place easily, and providing the manufacturing method of the printed wired board, without making small the effective area of the land for surface mounted devices provided in the outermost surface side.
[0018]
[Means for Solving the Problem]Namely, each wiring layer arranged at the upper part and bottom via a BAIA hole which an invention concerning claim 1 has two or more wiring layers and insulating layers which were accumulated by turns on an electrical insulating substrate, and was established in an insulating layer is connected, and. It has a land for surface mounted devices exposed to the outermost surface side from the best wiring layer covered with a surface protection layer, and a surface protection layer, And it is premised on a printed wired board currently formed of electrolytic plating at least by each wiring layer and a land for surface mounted devices after a two-layer eye, Cover a periphery edge of the above-mentioned land for surface mounted devices, make it stick to the side, and an electric insulation land holding layer is provided, And it is set up this land holding layer's upper surface constitute the upper surface and an approximately same flat surface of a land for surface mounted devices, or project from the upper surface of the above-mentioned land for surface mounted devices to the upper part side.
[0019]And it is set up the above-mentioned electric insulation land holding layer's upper surface constitute the upper surface and an approximately same flat surface of a land for surface mounted devices, or project from the upper surface of the above-mentioned land for surface mounted devices to the upper part side according to the printed wired board concerning this invention according to claim 1, Since the side of a land for surface mounted devices is not exposed by the above-mentioned land holding layer's existence, When external force is added in accordance with the direction of the surface of a printed wired board by a certain cause, external force cannot act on a land for surface mounted devices easily, And it becomes possible to prevent the exfoliation beforehand by the above-mentioned land holding layer's operation which stuck a periphery edge of a land for surface mounted devices on the side also [a case where external force and raising power are added temporarily], and was provided in it.
[0020]Although single boards, such as glass tissue (glass epoxy) with which an epoxy resin was impregnated, are mentioned as the above-mentioned electrical insulating substrate in such technical means, for example, application of a multilayer interconnection board which two or more inner layer circuit boards are laminated, and changes is also possible.
[0021]As electric insulation resin which constitutes an electric insulation land holding layer, epoxy system resin, acrylic resin, polyimide system resin, etc. can be used, for example. As epoxy system resin, bisphenol type epoxy resin, phenol novolak type epoxy resin, cresol novolak type epoxy resin, etc. can be illustrated, and acrylic-izing or a thing made methacrylic can apply the above-mentioned epoxy system resin as acrylic resin, for example.
[0022]Since a touch area between an electric insulation land holding layer and a land for surface mounted devices increases by performing a surface treatment, such as carrying out surface

roughening of the side of a land for surface mounted devices, in order to raise more adhesion power of a land for surface mounted devices with the above-mentioned electric insulation land holding layer, adhesion power improves. An invention concerning claim 2 is made from such a reason.

[0023]That is, a surface treatment which as for an invention concerning claim 2 raises adhesion with an electric insulation land holding layer on the side of the above-mentioned land for surface mounted devices on the assumption that a printed wired board concerning the invention according to claim 1 is performed.

[0024]In order to perform a surface treatment to the side of a land for surface mounted devices, For example, what is necessary is just to perform the above-mentioned surface treatment to the side, even if there are few lands for surface mounted devices provided on the above-mentioned insulating layer after forming a conductor layer by an electrolytic plating method, patternizing this and forming the best wiring layer and a land for surface mounted devices on an insulating layer before the best wiring layer is formed.

[0025]And blackening treatment is mentioned as such a surface treatment, for example. That is, it is applied when the above-mentioned land for surface mounted devices is constituted considering copper as a raw material, and blackening treatment is black on the copper land surface for surface mounted devices, and is processing which makes an oxide film which comprises CuO of a needle crystal generate. And this needle crystal enters to an inside of an electric insulation land holding layer who comprises the above-mentioned electric insulation resin, and raises both adhesion.

[0026]As a treating solution applied to such blackening treatment, what comprises the following presentations 1-4 is mentioned, for example.It is also possible to use an oxide treating solution (trade name; BO-200) marketed from Japanese MacDiarmid, Inc.

[0027]Blackening treatment liquid composition 1 (alkaline sodium chlorite solution)
5-20 g/l of $NaClO_2$30 - 60 g/lNaOH $_4$ [10 - 30 g/lNa_3PO] blackening treatment liquid composition 2 (alkaline potassium persulfate solution)
40-60 g/l of $K_2S_2O_8$5 - 20 g/lNaOH blackening treatment liquid composition 3 (potassium sulfide sal-ammoniac solution)
5-15 g/l of K_2S $_4$ [10 - 20 g/lNH] Cl blackening treatment liquid composition 4 acetic acid 20 g/lNH_4Cl 20 g/l copper acetate 10 g/l in addition, What is necessary is just to immerse an electrical insulating substrate which heats the treating solution to 80-100 ** bath temperature and by which a land for surface mounted devices was formed in a heated treating solution for 1 to 5 minutes, in applying blackening treatment liquid of the above-mentioned presentation 1 or the presentation 2. When applying blackening treatment liquid of the above-mentioned presentation 3, 60-80 ** of bath temperature, the immersion time 2 - a processing condition for 5 minutes may be sufficient, and when applying blackening treatment liquid of the presentation 4, 60-80 ** of bath temperature, the immersion time 1 - 10 minutes may be sufficient.

[0028]It is also possible to apply blackening treatment and detailed surfacing processing following this as the above-mentioned surface treatment. According to this detailed surfacing processing, a detailed and precise irregular surface which returns needlelike CuO generated by the above-mentioned blackening treatment, or dissolves, and comprises Cu or Cu_2O can be formed. And this detailed and precise irregular surface sticks to an electric insulation land holding layer who comprises electric insulation resin, and it becomes possible for both touch area to increase and to raise that adhesion power.

[0029]Acid buffer solution, for example, using acid, such as organic acid, such as inorganic acid, such as sulfuric acid, acetic acid, and phosphoric acid, or formic acid, acetic acid, tartaric acid, and citrate, and this, as a treating solution applied to such detailed surfacing processing is mentioned. Since especially buffer solution, such as phosphoric acid, citrate, and this, has good pH stability, and there is little change of pH even if it performs detailed surfacing processing continuously using the same bath in which treating solutions, such as this, were accommodated, it has an advantage to which throughput cannot fall easily. Like the above-mentioned buffer solution, for an opposite numerical value of a reciprocal of an acid dissociation constant, about 3.00 organic acid, for example, a glycine, bromoacetic acid, salicylic acid, (R,R)-tartaric acid, chloracetic acid, 2-chloropropionic acid, etc. excel [change / of pH under detailed surfacing processing] in few points, and it can use them suitably.

[0030]the pH of phosphoric acid or citric treatment liquid -- pH 0-3 — pH 1.5 to 2.5 thing is applied

preferably. if with an above-mentioned pH of less than zero strong acid is applied — the above — it is because the surface will be smoothed and it is hard to aim at improvement in adhesion power with the above-mentioned electric insulation resin layer, without forming detailed unevenness. Although it is possible to apply weak acid exceeding pH 3 on the other hand, it is because dissolution removal of CuO and formation of detailed unevenness will take a long time and processing efficiency will fall extremely.

[0031]It requires that a degree of disassociation of an acid solution cares about temperature conditions at the time of performing detailed surfacing processing in adjustment of the above-mentioned pH since it changes depending on temperature and the pH also changes depending on temperature. Being able to perform [and] detailed surfacing processing at about [room temperature -80 **] temperature, as for this processing time, it is desirable to carry out until a reaction of the above-mentioned treating solution and a land for copper surface mounted devices reaches an equilibrium situation, and it is usually 15 seconds - about 5 minutes. Since the degree of disassociation of phosphoric acid is high compared with citrate, it has an advantage which can perform acid treatment with low-temperature processing liquid temperature.

[0032]And as a phosphoric acid system treating solution of pH 0-3, buffer solution etc. which added optimum dose of disodium hydrogenphosphate, trisodium monophosphate, etc. are mentioned to a phosphoric acid aqueous solution or a phosphoric acid aqueous solution. As a citrate system treating solution of pH 0-3, buffer solution etc. which added a proper quantity of disodium phosphate or potassium citrate are applicable to solution or an aqueous-citric-acid solution of citrate. Buffer solution etc. which added a proper quantity of (citrate + potassium-dihydrogen-phosphate + boric acid + diethyl PAL BITSURU acid) or (boric acid + citrate + citrate) are mentioned to solution of trisodium monophosphate.

[0033]It is also possible to apply a reduction treating solution as a treating solution applied to the above-mentioned detailed surfacing processing. As such a reduction treating solution, a treating solution which comprises the following presentations 1-3 can be illustrated. It is also possible to use an oxide mailbox dip treating solution (trade name; BO-220) marketed from Japanese MacDiarmid, Inc.

[0034]Reduction treating solution presentation 1 diethyl amine boranes 3-5-g/l sodium hydroxide 3-5-g/l reduction treating solution (solution) presentation 2 sodium borohydride 3-5 g/l (however, sodium hydroxide addition)

Reduction treating solution (solution) presentation 3 specific hypophosphite 30 g/l (however, sodium hydroxide addition)

What is necessary is here, just to immerse an electrical insulating substrate which heated the treating solution to 20-50 ** bath temperature and by which blackening treatment was performed to a heated treating solution about 1 minute, in applying a reduction treating solution of the above-mentioned presentation 1. When applying a reduction treating solution of the above-mentioned presentation 2, 30-60 ** of bath temperature, the immersion time 5 - a processing condition for 10 minutes may be sufficient, and when applying a reduction treating solution of the presentation 3, 30-60 ** of bath temperature, the immersion time 5 - 10 minutes may be sufficient.

[0035]An invention concerning claim 3 relates to an invention which specified a printed wired board to which such blackening treatment etc. were performed as a surface treatment.

[0036]That is, an invention concerning claim 3 is characterized by being the detailed surfacing processing to which the above-mentioned land for surface mounted devices is constituted by copper on the assumption that a printed wired board concerning the invention according to claim 1, and the above-mentioned surface treatment follows blackening treatment or this blackening treatment.

[0037]Next, an invention concerning claim 4 - claim 9 relates to an invention which specified a manufacturing method of a printed wired board concerning claims 1-3 mentioned above.

[0038]Namely, an invention concerning claim 4 is premised on a manufacturing method of the printed wired board according to claim 1, A process of forming a conductor layer by an electrolytic plating method, patternizing this, and forming the best wiring layer and a land for surface mounted devices on an insulating layer before the best wiring layer is formed, An electric insulation resin layer is covered all over the above-mentioned best wiring layer and a land for surface mounted devices being included, And a process of buffing removing a part corresponding to a land for surface mounted devices of an electric insulation resin layer at least, and forming an electric insulation land holding layer, An invention which is characterized by providing and relates to claim 5, A process of forming a conductor layer by an electrolytic plating method, patternizing this, and forming the best wiring layer and a land for

surface mounted devices on an insulating layer before the best wiring layer is formed on the assumption that a manufacturing method of the printed wired board according to claim 2, an electric insulation resin layer all over a process and the above-mentioned best wiring layer which perform a surface treatment which raises adhesion with an electric insulation land holding layer of the formed above-mentioned land for surface mounted devices who forms at the following process to the side at least, and a land for surface mounted devices being included, [cover and] A process of buffing removing a part corresponding to a land for surface mounted devices of an electric insulation resin layer at least, and forming an electric insulation land holding layer is provided.

[0039]And since buffing has removed at least a part corresponding to a land for surface mounted devices of an electric insulation resin layer provided so that the whole surface containing the best wiring layer and a land for surface mounted devices might be covered according to the manufacturing methods, such as this, The above-mentioned electric insulation land holding layer can be formed that it is simple and certainly. When carrying out buffing of the electric insulation resin layer of a part corresponding to a land for surface mounted devices, since it is physically difficult to carry out buffing only of this part, buffing also of the electric insulation resin layer which exists on the best wiring layer will be carried out, and, as a result, the best wiring layer will also be exposed. For this reason, after forming the above-mentioned electric insulation land holding layer, photosensitive solder resist etc. which serve as a surface protection layer all over the best wiring layer and a land for surface mounted devices being included are formed, And a process at which the opening of the part corresponding to a land for surface mounted devices of this photosensitive solder resist is carried out, and a crowning of a land for surface mounted devices is exposed is needed. However, since the above-mentioned electric insulation land holding layer is already provided in a periphery edge of a land for surface mounted devices to expose like a conventional method even if it sets up a size of the above-mentioned opening more greatly than area of a land for surface mounted devices, problems, such as exfoliation by conventional technology mentioned above, are avoided.

[0040]Next, an invention concerning claim 6 relates to an invention which specified means forming of the above-mentioned best wiring layer and a land for surface mounted devices.

[0041]Namely, an invention concerning claim 6 is premised on a manufacturing method of a printed wired board concerning the invention according to claim 4 or 5, A means to patternize the above-mentioned conductor layer and to form the best wiring layer and a land for surface mounted devices is constituted by the photolithographic method using photosensitive resist.

[0042]When buffing of the electric insulation resin layer of a part corresponding to a land for surface mounted devices is carried out at least in the invention according to claim 4 or 5, It is based on process tolerance of polish, and the crowning side of a land for surface mounted devices which exists in the bottom in addition to an electric insulation resin layer, or the best wiring layer may also be ground, and thickness of a land for surface mounted devices or the best wiring layer is changed delicately, and may have an adverse effect on the electrical property. An invention concerning claim 7 relates to a manufacturing method which avoids this evil beforehand.

[0043]Namely, an invention concerning claim 7 is premised on a manufacturing method of a printed wired board concerning the invention according to claim 6, An electric insulation resin layer is covered all over the best wiring layers, such as this, and a land for surface mounted devices being included while the patternized best wiring layer and a photosensitive resist layer on a land for surface mounted devices had been made to remain, And at least, buffing of the part corresponding to a land for surface mounted devices of an electric insulation resin layer is carried out, and it is removed.

[0044]And since buffing of an electric insulation resin layer provided on it while the best wiring layer and a photosensitive resist layer on a land for surface mounted devices had been made to remain is performed according to this manufacturing method, It is also possible to remove simply a photosensitive resist layer which the crowning side of the best wiring layer and a land for surface mounted devices is not ground by operation of a photosensitive resist layer made to remain, and remains after buffing processing.

[0045]Therefore, since thickness of a land for surface mounted devices or the best wiring layer is not changed in spite of buffing processing, a printed wired board which has the stable electrical property can be obtained certainly.

[0046]When a manufacturing method concerning the invention according to claim 6 is enforced and the printed wired board according to claim 2 is manufactured, While the patternized best wiring layer and a photosensitive resist layer on a land for surface mounted devices had been made to remain, when

surface treatments, such as blackening treatment, are performed, a photosensitive resist layer which remains with the treating solution may separate. It is in this state, and when an electric insulation resin layer is covered and buffing of this is carried out for example, the crowning side of a land for surface mounted devices may be ground.An invention concerning claim 8 relates to a manufacturing method which has improved this point.

[0047]Namely, an invention concerning claim 8 is premised on a manufacturing method of a printed wired board concerning the invention according to claim 6, The patternized best wiring layer and a photosensitive resist layer which remains on a land for surface mounted devices are removed, After performing a surface treatment all over the exposed best wiring layer and a land for surface mounted devices, Cover an electric insulation resin layer all over a land for surface mounted devices and the best wiring layer to which a surface treatment was performed, which formed a photosensitive resist layer on the above-mentioned land for surface mounted devices at least and in which this photosensitive resist layer was formed being included, and. At least, buffing of the part corresponding to a land for surface mounted devices of an electric insulation resin layer is carried out, and it is removed.

[0048]And according to the manufacturing method concerning this invention, the patternized best wiring layer and a photosensitive resist layer which remains on a land for surface mounted devices are removed, After performing a surface treatment to the best wiring layer and a land for surface mounted devices from which a regist layer was removed, A photosensitive resist layer is formed on the above-mentioned land for surface mounted devices at least, And since an electric insulation resin layer was covered all over a land for surface mounted devices and the best wiring layer in which this photosensitive resist layer was formed being included and the above-mentioned buffing processing has been performed, the crowning side of a land for surface mounted devices is not ground.

[0049]An invention concerning claim 9 relates to an invention which specified the contents of the surface treatment in a manufacturing method concerning the invention according to claim 5 to 8.

[0050]That is, an invention concerning claim 9 is characterized by being the detailed surfacing processing to which the above-mentioned land for surface mounted devices is constituted by copper on the assumption that a manufacturing method of a printed wired board concerning the invention according to any one of claims 5 to 8, and the above-mentioned surface treatment follows blackening treatment or this blackening treatment.

[0051]

[Embodiment of the Invention]Hereafter, an embodiment of the invention is described in detail with reference to drawings.

[0052][A first embodiment] the printed wired board concerning this embodiment, The electrical insulating substrate 1 with a thickness of 1 mm which comprises glass epoxy as shown in drawing 1, The first wiring layer 21 to which it is provided on this substrate 1 and that thickness changes from copper foil which is 18 micrometers, The insulating layer 3 of 40 micrometers of thickness provided on this first wiring layer 21, the best wiring layer 22 made from coppering provided on this insulating layer 3, and the land 4 for surface mounted devices, The electric insulation land holding layer 5 who covered the periphery edge of this land 4 for surface mounted devices, stuck on that side, and was provided, The principal part comprises the surface protection layer 6 which covers the surface of the above-mentioned best wiring layer 22, and has the opening 61 to the part corresponding to the land 4 for surface mounted devices, The first wiring layer 21, the best wiring layer 22 and the first wiring layer 21, and the land 4 for surface mounted devices are connected via the BAIA hole 31 established in the above-mentioned insulating layer 3, respectively, and the land 4 for surface mounted devices and each upper surface of the electric insulation land holding layer 5 constitute the approximately same flat surface. About the first wiring layer 21, the best wiring layer 22, and the land 4 for surface mounted devices, the surface treatment of the blackening treatment described below and detailed surfacing processing is performed. Ten express these treating layers that showed typically among drawing 1.

[0053]And this printed wired board is manufactured through the following process.

[0054]"the formation process of the first wiring layer 21" — using the one side copper clad laminate by which 18-micrometer-thick copper foil was first stuck on one side of the electrical insulating substrate 1 which comprises 1-mm-thick glass epoxy — the above-mentioned copper foil top — photosensitive resist [— trade name by TOKYO OHKA KOGYO CO., LTD. ;P MER] was applied. Next, the photo mask was put on this photosensitive resist, negatives were exposed and developed selectively, and the above-mentioned photosensitive resist was removed selectively. The

photosensitive resist which remained has the pattern shape same in the first wiring layer 21 and abbreviation. And as the copper foil exposed from this photosensitive resist was etched, and the above-mentioned photosensitive resist which remains was removed and it was shown in drawing 2 (A), the first wiring layer 21 was formed on the electrical insulating substrate 1.

[0055]Next, after carrying out alkaline-degreasing processing of the surface of the first wiring layer 21 of the above and performing soft etching treatment for 30 seconds with a 110-g/l sodium persulfate solution, washing processing was performed with 5 more% of the weight of sulfuric acid.

[0056]next -- as opposed to the first wiring layer 21 to which these processings were performed -- the oxide treating solution by Japanese MacDiarmid (trade name: -- BO-200 and presentation; pure water: -- 41% of the weight) BO-200A:40 % of the weight, BO-200B:15 % of the weight, and BO-200C : After performing blackening treatment by using 4 % of the weight as blackening treatment liquid, Detailed surfacing processing was further performed with the oxide mailbox dip treating solution by Japanese MacDiarmid (trade name: BO-220, presentation; pure water:75 % of the weight, BO-220A:20 % of the weight, BO-220B:5 % of the weight) (refer to drawing 2 B).

[0057]The oxide film which used the cupric oxide as the main ingredients is formed in the surface of the first wiring layer 21 with the above-mentioned blackening treatment liquid, and the above-mentioned surface is considered to change to the oxide film and metallic copper which used copper I oxide as the main ingredients with a subsequent oxide mailbox dip treating solution. Ten show the treating layer formed in the first wiring layer 21 surface by these processings among drawing 2 (B).

[0058]"the formation process of the insulating layer 3" -- photosensitive insulating resin [Nippon Paint Co., Ltd. make trade name:PUROBI coat 5000] was first applied with screen printing all over the electrical insulating substrate 1 containing the first wiring layer 21, and the photosensitive insulating resin layer 30 was formed (refer to drawing 2 C).

[0059]What has photosensitivity as resin, such as an epoxy system, acrylic, and a polyimide system, is used preferably and it is applied by this embodiment as resin which constitutes an insulating layer is advantageous from a manufacturing process side. Even if it does not have photosensitivity, it can patternize by laser beam machining or other means. A coating method may not be limited to screen-stencil, either and methods, such as a curtain coat, may be sufficient as it.

[0060]Next, resin of the portion which exposes and carries out a development with the light exposure of 1500 mJ/cm^2 using the mask which performs prebaking for the above-mentioned photosensitive insulating resin layer 30 for 30 minutes at 90 **, and has a pattern of a desired BAIA hole, and serves as a BAIA hole was removed. The aperture of the BAIA hole was 120 micrometers. And after rinsing, baking powder was performed on condition of for 130 ** and 60 minutes, and the photosensitive insulating resin layer 30 was stiffened.

[0061]Next, buffing was performed to the hardened photosensitive insulating resin layer 30, using the buff of the granularity of No. 320 to about No. 800 one by one, flattening of the unevenness of the photosensitive insulating resin layer 30 produced with the level difference of a first wiring layer's 21 existence part and a nonexistence part was carried out, and the surface was roughened minutely. Thus, the insulating layer 3 of 40 micrometers of thickness which has the BAIA hole 31 was formed (refer to drawing 2 D).

[0062]"The formation process of the best wiring layer 22 and the land 4 for surface mounted devices", next permanganic acid solution (70 g/l of permanganic acid) After carrying out roughening treatment of the surface of the above-mentioned insulating layer 3 using 40 g/l of sodium hydroxide and carrying out neutralization processing with chloride, degreasing treatment was performed and also soft etching treatment was performed using sodium persulfate.

[0063]And all over the insulating layer 3 to which these processings were performed, the copper plating layer (conductive layer) about 2 micrometers thick was formed by the electroless deposition method, and the electrolytic copper metal skin about 20 micrometers thick was further formed on the above-mentioned copper plating layer (conductive layer) by the electrolytic plating method.

[0064]Next, the 35-micrometer-thick dry film was stuck on this electrolytic copper metal skin, and exposure and development were performed using the mask which has a desired circuit pattern. Resist is not limited to the dry film used by this embodiment, and liquefied resist, electrodeposited resist, etc. may be used for it. Then, it etched using ferric chloride, as shown in drawing 2 (E), the best wiring layer 22 and the land 4 for surface mounted devices were formed, and subsequently exfoliation processing of the above-mentioned dry film was performed.

[0065]Blackening treatment of the first wiring layer 21 and detailed surfacing processing, and same

processing were performed to these best wiring layer 22 and the land 4 for surface mounted devices, and the treating layer 10 was formed in these surfaces (refer to drawing 2 E).

[0066]All over "the electric insulation land holding layer's 5 formation process", next the best wiring layer 22 and the land 4 for surface mounted devices to which blackening treatment and detailed surfacing processing were performed being included, photosensitive-insulating-resin [— trade name by Nippon Paint Co., Ltd.: — after having applied PUROBI coat 5000] with screen printing, forming the photosensitive insulating resin layer 50 and prebaking on condition of for 90 ** and 30 minutes, full exposure was performed with the light exposure of 1500 mJ/cm^2. After rinsing, it baked for 60 minutes and 130 ** was stiffened (refer to drawing 2 F). Although buffing will remove the insulating resin formed on the land for surface mounted devices at the next process, It is the purpose of shortening the time which this polishing process takes, and it is preferred to remove beforehand insulating resin near the center of the land for surface mounted devices thickly formed especially by relations, such as surface tension. In a photosensitive case, in the case of exposure as the above-mentioned insulating resin is used by this embodiment Namely, a mask. It uses (however, since it is the purpose to remove insulating resin near the center of the land for surface mounted devices, near the center of the land for surface mounted devices applies the mask used as unexposed), When insulating resin is not photosensitivity, laser beam machining or other means may remove resin near the center on the land 4 for surface mounted devices, and it may be made to harden by performing baking powder for rinsing, 130 **, and 60 minutes.

[0067]Next, buffing of the photosensitive insulating resin layer 50 was performed using the buff of the granularity of No. 320 to about No. 800 one by one, and it ground until the land 4 for surface mounted devices was exposed at least. The electric insulation land holding layer 5 to whom the periphery edge of the land 4 for surface mounted devices was covered by this buffing processing as shown in drawing 2 (G), and it was stuck on that side is formed. It is preferred to wash after buffing, using permanganic acid solution (70 g/l of permanganic acid, 40 g/l of sodium hydroxide) etc., in order to avoid that the photosensitive insulating resin layer 50 remains on the above-mentioned land 4 for surface mounted devices.

[0068]After applying and carrying out temporary dryness of the solder resist finally made into the surface protection layer 6 all over the best wiring layer 22, the land 4 for surface mounted devices, and the electric insulation land holding layer 5 being included, exposure and development were performed and the surface protection layer 6 which has the opening 61 was formed in the part corresponding to the land 4 for surface mounted devices. The material of the surface protection layer 6 can use the homogeneous thing applied to the insulating layer.

[0069]The printed wired board which performed alkaline-degreasing processing, and performed soft etching treatment for 30 seconds in 110 g/l of sodium persulfate solution, and washed for 30 seconds with sulfuric acid of 5% of the weight of concentration, and was shown in drawing 1 was obtained.

[0070]"Adhesion power measurement test" In the printed wired board concerning this embodiment, The pull tester was tied to 100 micrometers in width before forming the surface protection layer 6, and the end of the 20-micrometer-thick land 4 for surface mounted devices, and it pulled up on the speed conditions for 50-mm/to the perpendicular (normal line direction on the surface of a printed wired board) until exfoliation started.

[0071]However, since about 0.4-0.6 cm and measurement according to the above-mentioned pull tester short are difficult for the linear dimension of the land 4 for real surface mounting components, On the same conditions as the manufacturing method concerning this embodiment, 100 micrometers in width, and 20 micrometers in thickness. The land 4 for surface mounted devices 4 cm in length was manufactured, and measurement with a pull tester was performed about this printed wired board for an examination (the same may be said of the printed wired board concerning the printed wired board and other embodiments which were manufactured with the following conventional methods). As a result, exfoliation of the land 4 for surface mounted devices began by the power of about 5.5g - 6.0 g.

[0072]Next, the adhesion power was measured in the way with the same similar of the land for surface mounted devices of the printed wired board (namely, thing of the structure where the electric insulation land holding layer 5 is not formed in the circumference of the land 4 for surface mounted devices) manufactured with the conventional method. As a result, that exfoliation started the above-mentioned land for surface mounted devices by the power of about 3.5g - 4.0 g.

[0073]Compared with the land for surface mounted devices concerning a conventional example, that adhesion power of the land for surface mounted devices of the printed wired board concerning this

invention was very large, and it has checked that it was hard to exfoliate so that this result might show.

[0074][A second embodiment] the printed wired board concerning this embodiment, The electrical insulating substrate 1 with a thickness of 1 mm which comprises glass epoxy as shown in drawing 3, The first wiring layer 21 to which it is provided on this substrate 1 and that thickness changes from copper foil which is 18 micrometers, The insulating layer 3 of 40 micrometers of thickness provided on this first wiring layer 21, the best wiring layer 22 made from coppering provided on this insulating layer 3, and the land 4 for surface mounted devices, The electric insulation land holding layer 5 who covered the periphery edge of this land 4 for surface mounted devices, stuck on that side, and was provided, The principal part comprises the surface protection layer 6 which covers the surface of the above-mentioned best wiring layer 22, and has the opening 61 to the part corresponding to the land 4 for surface mounted devices, The first wiring layer 21, the best wiring layer 22 and the first wiring layer 21, and the land 4 for surface mounted devices are connected via the BAIA hole 31 established in the above-mentioned insulating layer 3, respectively, and. It is provided so that the electric insulation land holding layer's 5 upper surface may project from the upper surface of the land 4 for surface mounted devices to the upper part side a little. About the first wiring layer 21, the best wiring layer 22, and the land 4 for surface mounted devices, the surface treatment of blackening treatment and detailed surfacing processing is performed, and the treating layer 10 is formed in each surface.

[0075]And this printed wired board is manufactured through the following process.

[0076]"The formation process of the first wiring layer 21", and "the formation process of the insulating layer 3"

Since it is the same process as a first embodiment, a statement is omitted.

[0077]"the formation process of the best wiring layer 22 and the land 4 for surface mounted devices" — the copper plating layer (conductive layer) about 2 micrometers thick was first formed in the whole surface in which the insulating layer 3 was formed by the electroless deposition method, and the electrolytic copper metal skin about 20 micrometers thick was further formed on the above-mentioned copper plating layer (conductive layer) by the electrolytic plating method.

[0078]next, this electrolytic copper metal skin top — photosensitive resist [-- trade name by TOKYO OHKA KOGYO CO., LTD. ;P MER] was applied. Next, the photo mask was put on this photosensitive resist, negatives were exposed and developed selectively, and the above-mentioned photosensitive resist was removed selectively. The photosensitive resist which remained has the pattern shape same in the best wiring layer 22, the land 4 for surface mounted devices, and abbreviation.

[0079]And as the electrolytic copper metal skin exposed from this photosensitive resist is etched and it is shown in drawing 4 (A), the best wiring layer 22 and the land 4 for surface mounted devices are formed, And the best wiring layer 22, blackening treatment of the land 4 for surface mounted devices, and detailed surfacing processing are performed on the same conditions as a first embodiment by the state where it has left the photosensitive resist r on these formed best wiring layer 22 and the land 4 for surface mounted devices, The treating layer 10 was formed in the part which is not covered with the above-mentioned photosensitive resist r (refer to drawing 4 B).

[0080]All over "the electric insulation land holding layer's 5 formation process", next the best wiring layer 22 and the land 4 for surface mounted devices on which blackening treatment and detailed surfacing processing are performed, and the photosensitive resist r is left behind to the upper surface being included, photosensitive-insulating-resin [— trade name by Nippon Paint Co., Ltd.: -- after having applied PUROBI coat 5000] with screen printing, forming the photosensitive insulating resin layer 50 and prebaking on condition of for 90 ** and 30 minutes, full exposure was performed with the light exposure of 1500 mJ/cm^2. After rinsing, it baked for 60 minutes and 130 ** was stiffened (refer to drawing 4 C). As mentioned above, a mask is used in the case of exposure, resin on the land 4 for surface mounted devices is removed, in a photosensitive case, baking powder may be performed for rinsing, 130 **, and 60 minutes, and it may be made to harden it here as the above-mentioned insulating resin is used by this embodiment.

[0081]Next, buffing of the photosensitive insulating resin layer 50 was performed using the buff of the granularity of No. 320 to about No. 800 one by one, and it ground until the photosensitive resist r on the land 4 for surface mounted devices was exposed at least. The electric insulation land holding layer 5 to whom the periphery edge of the land 4 for surface mounted devices was covered by this buffing processing as shown in drawing 4 (D), and it was stuck on that side is formed. And after buffing, the photosensitive resist r which remains on the above-mentioned land 4 for surface mounted devices or

the best wiring layer 22 was removed, and these surfaces were exposed (refer to drawing 4 E).
[0082]After applying and carrying out temporary dryness of the solder resist finally made into the surface protection layer 6 all over the best wiring layer 22, the land 4 for surface mounted devices, and the electric insulation land holding layer 5 being included, exposure and development were performed and the surface protection layer 6 which has the opening 61 was formed in the part corresponding to the land 4 for surface mounted devices. The material of the surface protection layer 6 can also use the homogeneous thing applied to the insulating layer, or a different material.
[0083]The printed wired board which performed alkaline-degreasing processing, and performed soft etching treatment for 30 seconds in 110 g/l of sodium persulfate solution, and washed for 30 seconds with sulfuric acid of 5% of the weight of concentration, and was shown in drawing 3 was obtained.
[0084]"Adhesion power measurement test" In the printed wired board concerning this embodiment, The pull tester was tied to the end of the land 4 for surface mounted devices with a width [before forming the surface protection layer 6] of 100 micrometers, and when it pulled up to the perpendicular (normal line direction on the surface of a printed wired board) and the adhesion power measurement test was done until exfoliation started, it had intensity equivalent to the printed wired board concerning a first embodiment.
[A third embodiment] the printed wired board concerning this embodiment, The electrical insulating substrate 1 with a thickness of 1 mm which comprises glass epoxy as shown in drawing 5, The first wiring layer 21 to which it is provided on this substrate 1 and that thickness changes from copper foil which is 18 micrometers, The insulating layer 3 of 40 micrometers of thickness provided on this first wiring layer 21, the best wiring layer 22 made from coppering provided on this insulating layer 3, and the land 4 for surface mounted devices, The electric insulation land holding layer 5 who covered the periphery edge of this land 4 for surface mounted devices, stuck on that side, and was provided, The principal part comprises the surface protection layer 6 which covers the surface of the above-mentioned best wiring layer 22, and has the opening 61 to the part corresponding to the land 4 for surface mounted devices, The first wiring layer 21, the best wiring layer 22 and the first wiring layer 21, and the land 4 for surface mounted devices are connected via the BAIA hole 31 established in the above-mentioned insulating layer 3, respectively, and. It is provided so that the electric insulation land holding layer's 5 upper surface may project from the upper surface of the land 4 for surface mounted devices to the upper part side. About the first wiring layer 21, the best wiring layer 22, and the land 4 for surface mounted devices, the surface treatment of blackening treatment and detailed surfacing processing is performed, and the treating layer 10 is formed in each surface.
[0085]And this printed wired board is manufactured through the following process.
[0086]"The formation process of the first wiring layer 21", "the formation process of the insulating layer 3", and "the formation process of the best wiring layer 22 and the land 4 for surface mounted devices"
Since it is the same process as a first embodiment, a statement is omitted.
[0087]the whole surface containing the best wiring layer 22 to which "formation process of electric insulation land holding layer 5" blackening treatment and detailed surfacing processing were performed, and the land 4 (refer to drawing 6 A) for surface mounted devices — photosensitive resist [-- trade name by TOKYO OHKA KOGYO CO., LTD. ;P MER], [apply and] And the photo mask was put on this photosensitive resist, negatives were exposed and developed selectively, and regist layer r was formed only on the land 4 for surface mounted devices (refer to drawing 6 B). As for this regist layer r, it is preferred to form somewhat more greatly than the area of the land 4 for surface mounted devices. Although this forms a photosensitive insulating resin layer on the above-mentioned land 4 for surface mounted devices via this regist layer r at a next process, it is because those remains can be avoided when removing a photosensitive insulating resin layer by forming regist layer r more greatly, even if the error on a manufacturing process arises.
[0088]Next, all over these, as shown in drawing 6 (C), photosensitive insulating resin [Nippon Paint Co., Ltd. make trade name:PUROBI coat 5000] is applied with screen printing, After forming the photosensitive insulating resin layer 50 and prebaking on condition of for 90 ** and 30 minutes, full exposure was performed with the light exposure of 1500 mJ/cm^2. After rinsing, it baked for 60 minutes and 130 ** was stiffened (refer to drawing 4 C).
[0089]Next, buffing of the photosensitive insulating resin layer 50 was performed using the buff of the granularity of No. 320 to about No. 800 one by one, and it ground to the grade which regist layer r on the land 4 for surface mounted devices exposes at least. The electric insulation land holding layer 5 to

whom the periphery edge of the land 4 for surface mounted devices was covered by this buffing processing as shown in drawing 6 (D), and it was stuck on that side is formed. And after buffing, regist layer r which remains on the above-mentioned land 4 for surface mounted devices was removed, and the surface of the land 4 for surface mounted devices was exposed (refer to drawing 6 E).
[0090]After applying and carrying out temporary dryness of the solder resist finally made into the surface protection layer 6 all over the best wiring layer 22, the land 4 for surface mounted devices, and the electric insulation land holding layer 5 being included, exposure and development were performed and the surface protection layer 6 which has the opening 61 was formed in the part corresponding to the land 4 for surface mounted devices.
[0091]The printed wired board which performed alkaline-degreasing processing, and performed soft etching treatment for 30 seconds in 110 g/l of sodium persulfate solution, and washed for 30 seconds with sulfuric acid of 5% of the weight of concentration, and was shown in drawing 3 was obtained.
[0092]"Adhesion power measurement test" In the printed wired board concerning this embodiment, The pull tester was tied to the end of the land 4 for surface mounted devices with a width [before forming the surface protection layer 6] of 100 micrometers, and when it pulled up to the perpendicular (normal line direction on the surface of a printed wired board) and the adhesion power measurement test was done until exfoliation started, it had intensity equivalent to the printed wired board concerning a first embodiment.
[0093]
[Effect of the Invention]It is set up an electric insulation land holding layer's upper surface constitute the upper surface and the approximately same flat surface of the land for surface mounted devices, or project from the upper surface of the above-mentioned land for surface mounted devices to the upper part side according to the printed wired board concerning the invention according to claim 1, Since the side of the land for surface mounted devices is not exposed by the above-mentioned land holding layer's existence, When external force is added in accordance with the direction of the surface of a printed wired board by a certain cause, external force cannot act on the land for surface mounted devices easily, And it has the effect that the exfoliation can be beforehand prevented by the above-mentioned land holding layer's operation which stuck the periphery edge of the land for surface mounted devices on the side also [the case where external force and raising power are added temporarily], and was provided in it.
[0094]According to the printed wired board concerning an invention given in claims 2 and 3, since surface treatments, such as blackening treatment, are performed to the side of the land for surface mounted devices, the touch area between the land for surface mounted devices and an electric insulation land holding layer increases, Since both adhesion power improves by this, it has the effect that exfoliation of the land for surface mounted devices can be prevented further.
[0095]Next, according to the manufacturing method of the printed wired board concerning claims 4-6 and the invention according to claim 9. Since buffing has removed the part corresponding to the land for surface mounted devices at least of an electric insulation resin layer provided so that the whole surface containing the best wiring layer and the land for surface mounted devices might be covered, It has an effect which can form simple and certainly the electric insulation land holding layer who covers the periphery edge of the land for surface mounted devices, sticks on the side, and is provided.
[0096]Since buffing of the electric insulation resin layer provided on it while the best wiring layer and the photosensitive resist layer on the land for surface mounted devices had been made to remain is performed according to the manufacturing method of the printed wired board concerning the invention according to claim 7, It is also possible to remove simply the photosensitive resist layer which the crowning side of the best wiring layer and the land for surface mounted devices is not ground by operation of the photosensitive resist layer made to remain, and remains after buffing processing.
[0097]Therefore, since the thickness of the land for surface mounted devices or the best wiring layer is not changed in spite of buffing processing, it has the effect that the printed wired board which has the stable electrical property can be obtained certainly.
[0098]According to the manufacturing method of the printed wired board concerning the invention according to claim 8. The patternized best wiring layer and the photosensitive resist layer which remains on the land for surface mounted devices are removed, After performing a surface treatment to the best wiring layer and the land for surface mounted devices from which the regist layer was removed, at least a photosensitive resist layer on the land for surface mounted devices, [form and] Since the electric insulation resin layer was covered all over the land for surface mounted devices and

the best wiring layer in which this photosensitive resist layer was formed being included and the above-mentioned buffing processing has been performed, it has the effect that the crowning side of the land for surface mounted devices is not ground.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The sectional view showing the outline composition of the printed wired board concerning a first embodiment of this invention.
[Drawing 2]Drawing 2 (A) – (G) is an explanatory view showing the manufacturing process of the printed wired board concerning a first embodiment.
[Drawing 3]The sectional view showing the outline composition of the printed wired board concerning a second embodiment of this invention.
[Drawing 4]Drawing 4 (A) – (E) is an explanatory view showing the manufacturing process of the printed wired board concerning a second embodiment.
[Drawing 5]The sectional view showing the outline composition of the printed wired board concerning a third embodiment of this invention.
[Drawing 6]Drawing 6 (A) – (E) is an explanatory view showing the manufacturing process of the printed wired board concerning a third embodiment.
[Drawing 7]Drawing 7 (A) – (D) is an explanatory view showing the manufacturing process of the conventional printed wired board by a fully-additive process.
[Drawing 8]Drawing 8 (A) – (G) is an explanatory view showing the manufacturing process of the conventional printed wired board by a semiadditive process.
[Drawing 9]Drawing 9 (A) – (F) is an explanatory view showing the manufacturing process of the conventional printed wired board by a subtractive process.
[Description of Notations]
1 Electrical insulating substrate
3 Insulating layer
4 The land for surface mounted devices
5 Electric insulation land holding layer
6 Surface protection layer
10 Treating layer
21 The first wiring layer
22 The best wiring layer
31 BAIA hole
61 Opening

[Translation done.]

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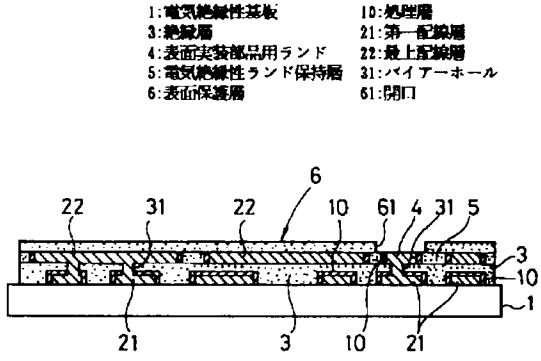
(54)【発明の名称】　プリント配線板とその製造方法

(57)【要約】

【課題】　最表面側に設けられる表面実装部品用ランドの実効面積を小さくすることなくその剥離が起こり難いプリント配線板とその製法を提供する。

【解決手段】　電気絶縁性基板１上に絶縁層３を介して複数の配線層を有しかつ最表面側に表面保護層６により被覆された最上配線層22と表面が露出した表面実装部品用ランド４を備え、表面実装部品用ランド等が電解メッキにより形成されているプリント配線板であって、表面実装部品用ランドの外周縁に亘ってその側面に密着させて電気絶縁性ランド保持層５が設けられ、このランド保持層５の表面が表面実装部品用ランドの上面と略同一面を構成するかあるいは上方側へ突出するように設定されていることを特徴とする。そして、上記表面実装部品用ランドに対しこれを剥離させる方向の外力が加わった場合でも上記ランド保持層５の作用によりその剥離を未然に防止する効果を有する。



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【特許請求の範囲】

【請求項１】電気絶縁性基板上に交互に積み重ねられた複数の配線層と絶縁層を有し、絶縁層に設けられたバイアーホールを介しその上側と下側に配置された各配線層が接続されていると共に、その最表面側には表面保護層により被覆された最上配線層と表面保護層から露出する表面実装部品用ランドを備え、かつ、少なくとも２層目以降の各配線層と表面実装部品用ランドが電解メッキにより形成されているプリント配線板において、

上記表面実装部品用ランドの外周縁に亘ってその側面に密着させて電気絶縁性ランド保持層が設けられ、かつ、このランド保持層の上面が表面実装部品用ランドの上面と略同一平面を構成するか若しくは上記表面実装部品用ランドの上面より上方側へ突出するように設定されていることを特徴とするプリント配線板。

【請求項２】上記表面実装部品用ランドの側面に、電気絶縁性ランド保持層との密着性を向上させる表面処理が施されていることを特徴とする請求項１記載のプリント配線板。

【請求項３】上記表面実装部品用ランドが銅により構成され、かつ、上記表面処理が黒化処理又はこの黒化処理に続く微細表面化処理であることを特徴とする請求項２記載のプリント配線板。

【請求項４】請求項１記載のプリント配線板の製造方法において、

最上配線層が形成される前の絶縁層上に電解メッキ法により導体層を成膜しこれをパターン化して最上配線層と表面実装部品用ランドを形成する工程、

上記最上配線層と表面実装部品用ランドを含む全面に電気絶縁性樹脂層を被覆し、かつ、少なくとも電気絶縁性樹脂層の表面実装部品用ランドに対応した部位をバフ研磨により除去して電気絶縁性ランド保持層を形成する工程、を具備することを特徴とするプリント配線板の製造方法。

【請求項５】請求項２記載のプリント配線板の製造方法において、

最上配線層が形成される前の絶縁層上に電解メッキ法により導体層を成膜しこれをパターン化して最上配線層と表面実装部品用ランドを形成する工程、

形成された上記表面実装部品用ランドの少なくとも側面に対し、次の工程で形成する電気絶縁性ランド保持層との密着性を向上させる表面処理を施す工程、

上記最上配線層と表面実装部品用ランドを含む全面に電気絶縁性樹脂層を被覆し、かつ、少なくとも電気絶縁性樹脂層の表面実装部品用ランドに対応した部位をバフ研磨により除去して電気絶縁性ランド保持層を形成する工程、を具備することを特徴とするプリント配線板の製造方法。

【請求項６】請求項４又は５記載のプリント配線板の製造方法において、

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上記導体層をパターン化して最上配線層と表面実装部品用ランドを形成する手段が、感光性レジストを用いるフォトリソグラフィー法により構成されていることを特徴とするプリント配線板の製造方法。

【請求項７】請求項６記載のプリント配線板の製造方法において、

パターン化された最上配線層と表面実装部品用ランド上の感光性レジスト層を残留させたままこれ等最上配線層と表面実装部品用ランドを含む全面に電気絶縁性樹脂層を被覆し、かつ、少なくとも電気絶縁性樹脂層の表面実装部品用ランドに対応した部位をバフ研磨して除去することを特徴とするプリント配線板の製造方法。

【請求項８】請求項６記載のプリント配線板の製造方法において、

パターン化された最上配線層と表面実装部品用ランド上に残留する感光性レジスト層を除去し、露出された最上配線層と表面実装部品用ランドの全面に表面処理を施した後、表面処理が施された少なくとも上記表面実装部品用ランド上に感光性レジスト層を形成し、かつ、この感光性レジスト層が形成された表面実装部品用ランド並びに最上配線層を含む全面に電気絶縁性樹脂層を被覆すると共に、少なくとも電気絶縁性樹脂層の表面実装部品用ランドに対応した部位をバフ研磨して除去することを特徴とするプリント配線板の製造方法。

【請求項９】上記表面実装部品用ランドが銅により構成され、かつ、上記表面処理が黒化処理又はこの黒化処理に続く微細表面化処理であることを特徴とする請求項５～８のいずれかに記載のプリント配線板の製造方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、ビルド・アップ法により製造されるプリント配線板とその製造方法に係り、特に、その最表面側に設けられる表面実装部品用ランド（表面実装部品を搭載するためあるいは半導体チップを搭載し接続するためのランド）の剥離が起こり難いプリント配線板の改良とその製造方法に関するものである。

【０００２】

【従来の技術】ビルド・アップ法は、電気絶縁性基板上に導体から成る配線層と電気絶縁層とを交互に、かつ、繰り返し積層してプリント配線板を製造する方法で、微細パターンの配線層を形成できる利点を有している。

【０００３】そして、このビルド・アップ法には、配線層の形成法に従って、フルアディティブ法、セミアディティブ法、及び、サブトラクティブ法に大別される。

【０００４】まず、上記フルアディティブ法は、図７に示すように接着剤層ｐが形成された電気絶縁性基板ａ上に感光性樹脂層ｂを設け（図７Ａ参照）、この感光性樹脂層ｂを部分的に露光・現像して永久レジスト層ｂ’を形成し（図７Ｂ参照）、この永久レジスト層ｂ’から露

出した部位に導体を選択的に成膜させて配線層ｃを形成する方法である（図７Ｃ参照）。尚、形成された配線層ｃと上記永久レジスト層ｂ’上に次の接着剤層（図示せず）を介して感光性樹脂ｂが設けられ、露光・現像と上記導体の成膜を繰り返して多層構造の配線層ｃが形成される（図７Ｄ参照）。

【０００５】しかし、このフルアディティブ法においては上記電気絶縁性基板ａ表面が接着剤層ｐにて被覆されているため、永久レジスト層ｂ’から露出した部位に導体を成膜させる手法として電解メッキを利用することができず、真空蒸着等の物理的気相成長法や無電解メッキ法等が利用されるに過ぎず、その成膜速度が遅く膜厚及び導電性に大きな制約を伴っており、かつ、成膜された導体の膜質も脆いといった問題を有している。

【０００６】これに対し、以下に述べるセミアディティブ法やサブトラクティブ法は、上記配線層の形成方法として電解メッキ法が適用できるため、厚膜で導電性に優れかつ脆くない緻密な配線層を容易に形成することが可能となる。

【０００７】すなわち、上記セミアディティブ法は、図８（Ａ）に示すように電気絶縁性基板ａの全面に無電解メッキ法等の方法により薄膜の導体層ｃ１を形成し、この導体層ｃ１上に感光性樹脂層を一様に設けかつ露光・現像によりパターン化して配線層形成部位が開口したマスク層ｂを形成する。次に、このマスク層ｂの開口から露出する導体層ｃ１上に電解メッキ法により厚膜の配線層ｃ２を成膜し、かつ、この配線層ｃ２上にのみはんだ層ｄを形成すると共に（図８Ｂ参照）、導体層ｃ１上に残留するマスク層ｂを除去してその部位の導体層ｃ１を露出させる（図８Ｃ参照）。次に、上記はんだ層ｄをエッチングレジストとしこのはんだ層ｄから露出する導体層ｃ１を除去して配線層ｃを形成する方法である（図８Ｄ参照）。次いで、最下位部の配線層ｃが形成された電気絶縁性基板ａの全面に電気絶縁性樹脂層ｅを形成し、この一部にバイアーホールｅ１を設けると共に、上記導体層ｃ１の形成から配線層の形成工程までを繰り返して図８（Ｅ）に示すように最表面側に最上配線層ｃと上述した表面実装部品用ランドｃ３を形成する（この例は２層の配線層で構成されている）。そして、最後に、最上配線層ｃと表面実装部品用ランドｃ３を含んだ全面に表面保護層となる感光性ソルダレジストｆを一様に形成し（図８Ｆ参照）、かつ、このレジストｆをパターニングして表面実装部品用ランドｃ３に対応する部位のみを開口させ、最上配線層ｃ等が表面保護層ｇで被覆されたプリント配線板を得る（図８Ｇ参照）。

【０００８】尚、このセミアディティブ法において上記電気絶縁性樹脂層ｅとしては感光性樹脂を利用することもできるが、これに限らず任意の電気絶縁性樹脂を利用することが可能である。そして、電気絶縁性樹脂ｅが感光性を有する場合には、これを露光・現像して上記バイアーホールｅ１を設けることができる。また、電気絶縁性樹脂に感光性がない場合には、レーザー光線等を照射して上記バイアーホールｅ１の形成部位に対応した電気絶縁性樹脂を除去すればよい。

【０００９】他方、上記サブトラクティブ法は、図９に示すように電気絶縁性基板ａの全面に無電解メッキ法により薄膜の導電層（図示せず）を成膜しかつ導電層上に電解メッキ法により厚膜の導体層ｃ’を形成すると共に、この導体層ｃ’上に感光性樹脂層を一様に設けかつ露光・現像によりパターン化してマスク層ｂを形成する（図９Ａ参照）。次に、上記マスク層ｂから露出する導体層ｃ’並びに導電層をエッチングにより除去し（図９Ｂ参照）、かつ、残留するマスク層ｂを除去して配線層ｃを形成する（図９Ｃ参照）方法である。次いで、最下位部の配線層ｃが形成された電気絶縁性基板ａの全面に電気絶縁性樹脂層ｅを形成し、この一部にバイアーホールｅ１を設けると共に、上記導体層ｃ’の形成から配線層の形成工程までを繰り返して図９（Ｄ）に示すように最表面側に最上配線層ｃと表面実装部品用ランドｃ３を形成する。そして、最後に、最上配線層ｃと表面実装部品用ランドｃ３を含んだ全面に表面保護層となる感光性ソルダレジストｆを一様に形成し（図９Ｅ参照）、かつ、このレジストｆをパターニングして表面実装部品用ランドｃ３に対応する部位のみを開口させ、最上配線層ｃ等が表面保護層ｇで被覆されたプリント配線板を得る（図９Ｆ参照）。

【００１０】尚、電気絶縁性樹脂ｅとしては感光性を有するものと感光性を持たない樹脂のいずれを適用することもでき、バイアーホールの形成工程はセミアディティブ法の場合と同様である。また、このサブトラクティブ法においては、上記電気絶縁性基板として銅等の金属箔が貼着された片面金属箔積層板等が適用された場合には、少なくとも２層目以降の各配線層を構成する導体層が金属メッキ法により成膜されることになる。

【００１１】

【発明が解決しようとする課題】この様にセミアディティブ法やサブトラクティブ法は、上述したフルアディティブ法に較べて厚膜で導電性に優れかつ脆くない緻密な配線層を容易に形成できるため、電気特性に優れたプリント配線板が得られる利点を有している。

【００１２】しかし、図８（Ｆ）～図８（Ｇ）及び図９（Ｅ）～図８（Ｆ）に示したように上記表面実装部品用ランドｃ３のみが露出する表面保護層ｇを形成する際、感光性ソルダレジストｆのパターン加工精度の誤差を考慮に入れて表面保護層ｇの開口ｈ寸法を表面実装部品用ランドｃ３の面積より若干大きめに設定する必要があるため、上記開口ｈの開口縁と表面実装部品用ランドｃ３との間には必然的に隙間が生ずることになる。

【００１３】この様に表面実装部品用ランドｃ３と表面保護層ｇの開口縁との間に隙間が生じてこれ等が接続さ

れていないため、何らかの原因によりプリント配線板の表面方向に沿って外力が加わった場合、この外力の作用により上記表面実装部品用ランドｃ３が剥離し易いという問題点があった。

【００１４】また、上記表面実装部品用ランドｃ３はその底面でプリント配線板に密着しているだけであるためその密着力が弱く、垂直方向に引き上げる力が作用した場合においても剥離し易いという問題点があった。

【００１５】特に、製品保守等の理由から電気部品を取り外すような場合に、表面実装部品用ランドｃ３には上述したような外力や引上げ力が作用することになるため剥離し易い問題点があった。

【００１６】尚、上記表面保護層ｇの開口ｈ寸法を表面実装部品用ランドｃ３の面積より小さめに設定し、表面実装部品用ランドｃ３の外周縁の一部が表面保護層ｇにより被覆されるような構成を採ることにより上記表面実装部品用ランドの剥離を回避することは可能である。しかし、この様な構成を採った場合、表面実装部品用ランドの一部が表面保護層により覆われるため、その分、表面実装部品用ランドの露出面積が小さくなってしまい、この表面実装部品用ランド上に表面実装部品や半導体チップ等を搭載する作業が繁雑となる別な問題点を有する。

【００１７】本発明はこのような問題点に着目してなされたもので、その課題とするところは、最表面側に設けられる表面実装部品用ランドの実効面積を小さくすることなくその剥離が起こり難いプリント配線板を提供し、合わせてそのプリント配線板の製造方法を提供することにある。

【００１８】

【課題を解決するための手段】すなわち、請求項１に係る発明は、電気絶縁性基板上に交互に積み重ねられた複数の配線層と絶縁層を有し、絶縁層に設けられたバイアーホールを介しその上側と下側に配置された各配線層が接続されていると共に、その最表面側には表面保護層により被覆された最上配線層と表面保護層から露出する表面実装部品用ランドを備え、かつ、少なくとも２層目以降の各配線層と表面実装部品用ランドが電解メッキにより形成されているプリント配線板を前提とし、上記表面実装部品用ランドの外周縁に亘ってその側面に密着させて電気絶縁性ランド保持層が設けられ、かつ、このランド保持層の上面が表面実装部品用ランドの上面と略同一平面を構成するか若しくは上記表面実装部品用ランドの上面より上方側へ突出するように設定されていることを特徴とするものである。

【００１９】そして、この請求項１記載の発明に係るプリント配線板によれば、上記電気絶縁性ランド保持層の上面が表面実装部品用ランドの上面と略同一平面を構成するか若しくは上記表面実装部品用ランドの上面より上方側へ突出するように設定され、上記ランド保持層の存在により表面実装部品用ランドの側面が露出していないため、何らかの原因によりプリント配線板の表面方向に沿って外力が加わった場合においても表面実装部品用ランドに外力が作用し難く、かつ、仮に外力や引上げ力が加わった場合にも表面実装部品用ランドの外周縁に亘ってその側面に密着させて設けられた上記ランド保持層の作用によりその剥離を未然に防止することが可能となる。

【００２０】この様な技術的手段において上記電気絶縁性基板としては、例えば、エポキシ樹脂が含浸されたガラス繊維布（ガラス・エポキシ）等の単一基板が挙げられるが、複数の内層回路板が積層されて成る多層配線基板の適用も可能である。

【００２１】また、電気絶縁性ランド保持層を構成する電気絶縁性樹脂としては、例えば、エポキシ系樹脂、アクリル系樹脂、ポリイミド系樹脂等が利用できる。尚、エポキシ系樹脂としては、ビスフェノール型エポキシ樹脂、フェノールノボラック型エポキシ樹脂、クレゾールノボラック型エポキシ樹脂等が例示でき、アクリル系樹脂としては、例えば、上記エポキシ系樹脂をアクリル化又はメタクリル化したものが適用できる。

【００２２】尚、上記電気絶縁性ランド保持層と表面実装部品用ランドの密着力をより向上させるためには、表面実装部品用ランドの側面を粗面化する等の表面処理を施すことにより電気絶縁性ランド保持層と表面実装部品用ランドとの間の接触面積が増大するため密着力が向上する。請求項２に係る発明はこの様な理由からなされている。

【００２３】すなわち、請求項２に係る発明は、請求項１記載の発明に係るプリント配線板を前提とし、上記表面実装部品用ランドの側面に、電気絶縁性ランド保持層との密着性を向上させる表面処理が施されていることを特徴とするものである。

【００２４】尚、表面実装部品用ランドの側面に表面処理を施すためには、例えば、最上配線層が形成される前の絶縁層上に電解メッキ法により導体層を成膜しこれをパターン化して最上配線層と表面実装部品用ランドを形成した後、上記絶縁層上に設けられた表面実装部品用ランドの少なくとも側面に対して上記表面処理を施せばよい。

【００２５】そして、この様な表面処理として、例えば、黒化処理が挙げられる。すなわち黒化処理は上記表面実装部品用ランドが銅を素材として構成されている場合に適用されるもので、銅製の表面実装部品用ランド表面に黒色で針状結晶のＣｕＯより成る酸化膜を生成させる処理である。そして、この針状結晶が上記電気絶縁性樹脂から成る電気絶縁性ランド保持層の内部まで入り込み両者の密着性を向上させる。

【００２６】このような黒化処理に適用される処理液としては、例えば、下記組成１～４から成るものが挙げら

れる。また、日本マクダーミッド（株）から市販されているオキサイド処理液（商品名；ＢＯ－２００）を利用することも可能である。

【００２７】黒化処理液組成１（アルカリ性亜塩素酸ナトリウム水溶液）

$NaClO_2$	３０～６０ｇ／ｌ
NaOH	１０～３０ｇ／ｌ
Na_3PO_4	５～２０ｇ／ｌ

黒化処理液組成２（アルカリ性過硫酸カリウム水溶液）

$K_2S_2O_8$	５～２０ｇ／ｌ
NaOH	４０～６０ｇ／ｌ

黒化処理液組成３（硫化カリウム－塩化アンモニア水溶液）

K_2S	１０～２０ｇ／ｌ
NH_4Cl	５～１５ｇ／ｌ

黒化処理液組成４

酢酸	２０ｇ／ｌ
NH_4Cl	２０ｇ／ｌ
酢酸銅	１０ｇ／ｌ

尚、上記組成１又は組成２の黒化処理液を適用する場合には、その処理液を８０～１００℃の浴温に加熱し、加熱された処理液に表面実装部品用ランドが形成された電気絶縁性基板を１～５分浸漬すればよい。また、上記組成３の黒化処理液を適用する場合には、浴温６０～８０℃、浸漬時間２～５分の処理条件でよく、組成４の黒化処理液を適用する場合には、浴温６０～８０℃、浸漬時間１～１０分でよい。

【００２８】また、上記表面処理として、黒化処理とこれに続く微細表面化処理を適用することも可能である。この微細表面化処理によれば、上記黒化処理で生成された針状のＣｕＯを還元し又は溶解してＣｕ又はCu_2Oから成る微細で緻密な凹凸表面を形成することができる。そして、この微細で緻密な凹凸表面が電気絶縁性樹脂から成る電気絶縁性ランド保持層に密着し、両者の接触面積が増大してその密着力を向上させることが可能となる。

【００２９】このような微細表面化処理に適用される処理液としては、例えば、硫酸、酢酸、燐酸等の無機酸、若しくは、蟻酸、酢酸、酒石酸、クエン酸等の有機酸、及び、これ等の酸を用いる酸性の緩衝液が挙げられる。特に、燐酸並びにクエン酸及びこれ等の緩衝液はｐＨ安定性が良好なため、これ等処理液が収容された同一浴を用いて連続的に微細表面化処理を行ってもｐＨの変動が少ないことから処理能力が低下し難い利点を有している。また、上記緩衝液と同様に、酸解離定数の逆数の対数値で、３．００程度の有機酸、例えば、グリシン、ブロモ酢酸、サリチル酸、（Ｒ，Ｒ）－酒石酸、クロロ酢酸、２－クロロプロピオン酸等も微細表面化処理中のｐＨの変動が少ない点で優れており、好適に利用できる。

【００３０】尚、リン酸若しくはクエン酸処理液のｐＨはｐＨ０～３、好ましくはｐＨ１．５～２．５のものが適用される。上記ｐＨ０未満の強い酸を適用すると上記微細な凹凸が形成されることなく表面が平滑化されてしまい、上記電気絶縁性樹脂層との密着力の向上を図り難いからである。一方、ｐＨ３を越える弱い酸を適用することは可能であるが、ＣｕＯの溶解除去と微細な凹凸の形成に長時間を要してしまい処理効率が極端に低下してしまうからである。

【００３１】また、酸溶液の解離度は温度に依存して変化しそのｐＨも温度に依存して変化するため、上記ｐＨの調整に当たっては微細表面化処理を行う際の温度条件に留意することを要する。尚、微細表面化処理は室温～８０℃程度の温度で行うことができ、また、この処理時間は上記処理液と銅製表面実装部品用ランドとの反応が平衡状態に達するまで行うことが望ましく、通常１５秒～５分程度である。また、リン酸は、クエン酸に較べて解離度が高いため低温の処理液温度で酸処理が行える利点を有している。

【００３２】そして、ｐＨ０～３のリン酸系処理液としては、リン酸水溶液あるいはリン酸水溶液に適量のリン酸水素二ナトリウム、リン酸三ナトリウム等を添加した緩衝液等が挙げられる。また、ｐＨ０～３のクエン酸系処理液としては、クエン酸の水溶液あるいはクエン酸水溶液に燐酸水素二ナトリウム又はクエン酸カリウムを適量添加した緩衝液等が適用できる。また、リン酸三ナトリウムの水溶液に（クエン酸＋リン酸二水素カリウム＋ホウ酸＋ジエチルバルビツル酸）又は（ホウ酸＋クエン酸＋クエン酸）を適量添加した緩衝液等が挙げられる。

【００３３】また、上記微細表面化処理に適用される処理液として還元処理液を適用することも可能である。このような還元処理液としては、下記組成１～３から成る処理液が例示できる。また、日本マクダーミッド（株）から市販されているオキサイド・ボスト・ディップ処理液（商品名；ＢＯ－２２０）を利用することも可能である。

【００３４】還元処理液組成１

ジエチルアミンボラン	３～５ｇ／ｌ
水酸化ナトリウム	３～５ｇ／ｌ

還元処理液（水溶液）組成２

水素化ホウ素ナトリウム	３～５ｇ／ｌ

（但し、水酸化ナトリウムを添加）

還元処理液（水溶液）組成３

次亜燐酸ナトリウム	３０ｇ／ｌ

（但し、水酸化ナトリウムを添加）

ここで、上記組成１の還元処理液を適用する場合には、その処理液を２０～５０℃の浴温に加熱し、加熱された処理液に黒化処理が施された電気絶縁性基板を１分程度浸漬すればよい。また、上記組成２の還元処理液を適用する場合には、浴温３０～６０℃、浸漬時間５～１０分の処理条件でよく、組成３の還元処理液を適用する場合

には、浴温３０～６０℃、浸漬時間５～１０分でよい。

【００３５】尚、請求項３に係る発明は表面処理としてこの様な黒化処理等が施されたプリント配線板を特定した発明に関する。

【００３６】すなわち、請求項３に係る発明は、請求項１記載の発明に係るプリント配線板を前提とし、上記表面実装部品用ランドが銅により構成され、かつ、上記表面処理が黒化処理又はこの黒化処理に続く微細表面化処理であることを特徴とする。

【００３７】次に、請求項４～請求項９に係る発明は、上述した請求項１～３に係るプリント配線板の製造方法を特定した発明に関する。

【００３８】すなわち、請求項４に係る発明は、請求項１記載のプリント配線板の製造方法を前提とし、最上配線層が形成される前の絶縁層上に電解メッキ法により導体層を成膜しこれをパターン化して最上配線層と表面実装部品用ランドを形成する工程、上記最上配線層と表面実装部品用ランドを含む全面に電気絶縁性樹脂層を被覆し、かつ、少なくとも電気絶縁性樹脂層の表面実装部品用ランドに対応した部位をバフ研磨により除去して電気絶縁性ランド保持層を形成する工程、を具備することを特徴とし、また、請求項５に係る発明は、請求項２記載のプリント配線板の製造方法を前提とし、最上配線層が形成される前の絶縁層上に電解メッキ法により導体層を成膜しこれをパターン化して最上配線層と表面実装部品用ランドを形成する工程、形成された上記表面実装部品用ランドの少なくとも側面に対し、次の工程で形成する電気絶縁性ランド保持層との密着性を向上させる表面処理を施す工程、上記最上配線層と表面実装部品用ランドを含む全面に電気絶縁性樹脂層を被覆し、かつ、少なくとも電気絶縁性樹脂層の表面実装部品用ランドに対応した部位をバフ研磨により除去して電気絶縁性ランド保持層を形成する工程、を具備することを特徴とするものである。

【００３９】そして、これ等の製造方法によれば、最上配線層と表面実装部品用ランドを含む全面を被覆するように設けられた電気絶縁性樹脂層の少なくとも表面実装部品用ランドに対応した部位をバフ研磨により除去しているため、上記電気絶縁性ランド保持層を簡便にかつ確実に形成することができる。尚、表面実装部品用ランドに対応した部位の電気絶縁性樹脂層をバフ研磨する際、この部位のみをバフ研磨することは物理的に困難なため最上配線層上に存在する電気絶縁性樹脂層もバフ研磨され、この結果、最上配線層も露出されることになる。このため、上記電気絶縁性ランド保持層を形成した後、最上配線層と表面実装部品用ランドを含む全面に表面保護層となる感光性ソルダレジスト等を成膜し、かつ、この感光性ソルダレジストの表面実装部品用ランドに対応する部位を開口させて表面実装部品用ランドの頂部を露出させる工程が必要となる。但し、従来法と同様、上記開口の寸法を表面実装部品用ランドの面積より大きく設定しても、露出する表面実装部品用ランドの外周縁には上記電気絶縁性ランド保持層が既に設けられているため、従来技術による上述した剥離等の問題は回避される。

【００４０】次に、請求項６に係る発明は上記最上配線層と表面実装部品用ランドの形成手段を特定した発明に関する。

【００４１】すなわち、請求項６に係る発明は、請求項４又は５記載の発明に係るプリント配線板の製造方法を前提とし、上記導体層をパターン化して最上配線層と表面実装部品用ランドを形成する手段が、感光性レジストを用いるフォトリソグラフィー法により構成されていることを特徴とするものである。

【００４２】尚、請求項４又は５記載の発明において、少なくとも表面実装部品用ランドに対応した部位の電気絶縁性樹脂層をバフ研磨する際、研磨の加工精度にもよるが電気絶縁性樹脂層以外にその下側に存在する表面実装部品用ランドや最上配線層の頂部側も研磨されてしまうことがあり、表面実装部品用ランドや最上配線層の膜厚が微妙に変動してその電気特性に悪影響を及ぼしてしまう場合がある。請求項７に係る発明はこの弊害を未然に回避する製造方法に関する。

【００４３】すなわち、請求項７に係る発明は、請求項６記載の発明に係るプリント配線板の製造方法を前提とし、パターン化された最上配線層と表面実装部品用ランド上の感光性レジスト層を残留させたままこれ等最上配線層と表面実装部品用ランドを含む全面に電気絶縁性樹脂層を被覆し、かつ、少なくとも電気絶縁性樹脂層の表面実装部品用ランドに対応した部位をバフ研磨して除去することを特徴とするものである。

【００４４】そして、この製造方法によれば、最上配線層と表面実装部品用ランド上の感光性レジスト層を残留させたままその上に設けられた電気絶縁性樹脂層のバフ研磨を行っているため、残留させた感光性レジスト層の作用により最上配線層と表面実装部品用ランドの頂部側が研磨されることがなく、かつ、バフ研磨処理の後に残留する感光性レジスト層を簡単に除去することも可能である。

【００４５】従って、バフ研磨処理にも拘らず表面実装部品用ランドや最上配線層の膜厚が変動することがないため、安定した電気特性を有するプリント配線板を確実に得ることができる。

【００４６】また、請求項６記載の発明に係る製造方法を実施して請求項２記載のプリント配線板を製造する場合、パターン化された最上配線層と表面実装部品用ランド上の感光性レジスト層を残留させたまま黒化処理等の表面処理を施した場合、その処理液により残留する感光性レジスト層が剥がれてしまうことがある。この状態で、例えば、電気絶縁性樹脂層を被覆しかつこれをバフ研磨した場合、表面実装部品用ランドの頂部側が研磨さ

れてしまうことがある。請求項８に係る発明はこの点を改善した製造方法に関する。

【００４７】すなわち、請求項８に係る発明は、請求項６記載の発明に係るプリント配線板の製造方法を前提とし、パターン化された最上配線層と表面実装部品用ランド上に残留する感光性レジスト層を除去し、露出された最上配線層と表面実装部品用ランドの全面に表面処理を施した後、表面処理が施された少なくとも上記表面実装部品用ランド上に感光性レジスト層を形成し、かつ、この感光性レジスト層が形成された表面実装部品用ランド並びに最上配線層を含む全面に電気絶縁性樹脂層を被覆すると共に、少なくとも電気絶縁性樹脂層の表面実装部品用ランドに対応した部位をバフ研磨して除去することを特徴とするものである。

【００４８】そして、この発明に係る製造方法によれば、パターン化された最上配線層と表面実装部品用ランド上に残留する感光性レジスト層を除去し、レジスト層が除去された最上配線層と表面実装部品用ランドに対し表面処理を施した後、少なくとも上記表面実装部品用ランド上に感光性レジスト層を形成し、かつ、この感光性レジスト層が形成された表面実装部品用ランド並びに最上配線層を含む全面に電気絶縁性樹脂層を被覆して上記バフ研磨処理を施しているため、表面実装部品用ランドの頂部側が研磨されることがない。

【００４９】尚、請求項９に係る発明は、請求項５～８記載の発明に係る製造方法における表面処理の内容を特定した発明に関する。

【００５０】すなわち、請求項９に係る発明は、請求項５～８のいずれかに記載の発明に係るプリント配線板の製造方法を前提とし、上記表面実装部品用ランドが銅により構成され、かつ、上記表面処理が黒化処理又はこの黒化処理に続く微細表面化処理であることを特徴とする。

【００５１】

【発明の実施の形態】以下、本発明の実施の形態について図面を参照して詳細に説明する。

【００５２】［第一実施の形態］この実施の形態に係るプリント配線板は、図１に示すようにガラス－エポキシから成る厚さ１ｍｍの電気絶縁性基板１と、この基板１上に設けられその膜厚が１８μｍの銅箔から成る第一配線層２１と、この第一配線層２１上に設けられた膜厚４０μｍの絶縁層３と、この絶縁層３上に設けられた銅メッキ製の最上配線層２２及び表面実装部品用ランド４と、この表面実装部品用ランド４の外周縁に亘ってその側面に密着させて設けられた電気絶縁性ランド保持層５と、上記最上配線層２２の表面を被覆しかつ表面実装部品用ランド４に対応した部位に開口６１を有する表面保護層６とでその主要部が構成されており、上記絶縁層３に設けられたバイアーホール３１を介して第一配線層２１と最上配線層２２、及び、第一配線層２１と表面実装部品用ランド４とがそれぞれ接続されていると共に、表面実装部品用ランド４と電気絶縁性ランド保持層５の各上面が略同一平面を構成している。また、第一配線層２１、最上配線層２２及び表面実装部品用ランド４については以下に述べる黒化処理と微細表面化処理の表面処理が施されている。尚、図１中、１０は模式的に示したこれらの処理層を表している。

【００５３】そして、このプリント配線板は次の工程を経て製造されたものである。

【００５４】「第一配線層２１の形成工程」まず、厚さ１ｍｍのガラス－エポキシから成る電気絶縁性基板１の片面に厚さ１８μｍの銅箔が貼着された片面銅張積層板を用い、上記銅箔上に感光性レジスト［東京応化工業（株）製　商品名；ＰＭＥＲ］を塗布した。次に、この感光性レジストにフォトマスクを重ね、部分的に露光・現像して上記感光性レジストを部分的に除去した。尚、残存した感光性レジストは第一配線層２１と略同一のパターン形状を有している。そして、この感光性レジストから露出する銅箔をエッチングし、かつ、残存する上記感光性レジストを除去して図２（Ａ）に示すように電気絶縁性基板１上に第一配線層２１を形成した。

【００５５】次に、上記第一配線層２１の表面をアルカリ脱脂処理し、かつ、１１０ｇ／ｌの過硫酸ナトリウム溶液で３０秒間のソフトエッチング処理を施した後、さらに５重量％の硫酸で洗浄処理を施した。

【００５６】次に、これら処理が施された第一配線層２１に対し、日本マクダーミッド（株）製のオキサイド処理液（商品名：ＢＯ－２００，組成；純水：４１重量％、ＢＯ－２００Ａ：４０重量％、ＢＯ－２００Ｂ：１５重量％、ＢＯ－２００Ｃ：４重量％）を黒化処理液として黒化処理を施した後、日本マクダーミッド（株）製のオキサイド・ポストディップ処理液（商品名：ＢＯ２２０，組成；純水：７５重量％、ＢＯ－２２０Ａ：２０重量％、ＢＯ－２２０Ｂ：５重量％）で更に微細表面化処理を施した（図２Ｂ参照）。

【００５７】尚、上記黒化処理液で第一配線層２１の表面に酸化第二銅を主成分とした酸化皮膜が形成され、かつ、その後のオキサイド・ポストディップ処理液によって上記表面は酸化第一銅を主成分とした酸化皮膜及び金属銅に変化しているものと思われる。図２（Ｂ）中、１０はこれら処理により第一配線層２１表面に形成された処理層を示している。

【００５８】「絶縁層３の形成工程」まず、第一配線層２１を含む電気絶縁性基板１の全面に感光性絶縁樹脂［日本ペイント（株）製　商品名：ブロビコート５０００］をスクリーン印刷法により塗布し、感光性絶縁樹脂層３０を形成した（図２Ｃ参照）。

【００５９】尚、絶縁層を構成する樹脂としては、エポキシ系、アクリル系、ポリイミド系などの樹脂が好ましく用いられ、この実施の形態で適用されているように感

光性を有するものが製造工程面から有利である。また、感光性を有していなくてもレーザ加工などの手段によりパターン化が可能である。また、塗布方法も、スクリーン印刷に限定されることはなくカーテンコートなどの方法でもよい。

【００６０】次に、上記感光性絶縁樹脂層３０を９０℃で３０分間プリベークを行い、かつ、所望のバイアーホールのパターンを有するマスクを用い１５００ｍＪ／ｃｍ²の露光量で露光を行い、現像処理してバイアーホールとなる部分の樹脂を除去した。尚、バイアーホールの孔径は１２０μｍであった。そして、水洗後、１３０℃、６０分間の条件でベーキングを行い感光性絶縁樹脂層３０を硬化させた。

【００６１】次に、硬化した感光性絶縁樹脂層３０に対し、３２０番から８００番程度の粗さのバフを順次用いてバフ研磨を行い、第一配線層２１の存在部位と非存在部位の段差によって生じる感光性絶縁樹脂層３０の凹凸を平坦化すると共に、表面を微細に粗化した。このようにしてバイアーホール３１を有する膜厚４０μｍの絶縁層３を形成した（図２Ｄ参照）。

【００６２】「最上配線層２２と表面実装部品用ランド４の形成工程」次に、過マンガン酸水溶液（過マンガン酸７０ｇ／ｌ、水酸化ナトリウム４０ｇ／ｌ）を用いて上記絶縁層３の表面を粗化処理し、かつ、塩酸で中和処理した後、脱脂処理を施し、更に過硫酸ナトリウムを用いてソフトエッチング処理を施した。

【００６３】そして、これら処理が施された絶縁層３の全面に、無電解メッキ法により厚さ約２μｍの銅メッキ層（導電層）を形成し、更に、電解メッキ法により上記銅メッキ層（導電層）上に厚さ約２０μｍの電解銅メッキ層を形成した。

【００６４】次に、この電解銅メッキ層上に厚さ３５μｍのドライフィルムを貼着し、所望の配線パターンを有するマスクを用いて露光・現像を行った。尚、レジストは、この実施の形態で用いられているドライフィルムに限定されることはなく、液状のレジストや電着レジストなどを用いてもよい。その後、塩化第二鉄を用いてエッチングを行い、図２（Ｅ）に示すように最上配線層２２と表面実装部品用ランド４を形成し、次いで上記ドライフィルムの剥離処理を行った。

【００６５】更に、第一配線層２１の黒化処理及び微細表面化処理と同様の処理をこれら最上配線層２２と表面実装部品用ランド４に対して行い、これらの表面に処理層１０を形成した（図２Ｅ参照）。

【００６６】「電気絶縁性ランド保持層５の形成工程」次に、黒化処理と微細表面化処理が施された最上配線層２２と表面実装部品用ランド４を含む全面に、感光性絶縁樹脂［日本ペイント（株）製　商品名：プロビコート５０００］をスクリーン印刷法により塗布し、感光性絶縁樹脂層５０を形成し、９０℃、３０分間の条件でプリベークした後、１５００ｍＪ／ｃｍ²の露光量で全面露光を行った。水洗後、１３０℃、６０分間ベーキングして硬化させた（図２Ｆ参照）。尚、後の工程で表面実装部品用ランド上に形成された絶縁樹脂はバフ研磨によって除去することになるが、この研磨工程に要する時間を短縮させる目的で、特に表面張力等の関係で厚く形成される表面実装部品用ランドの中央付近の絶縁樹脂を予め除去しておくことが好ましい。すなわち、上記絶縁樹脂がこの実施の形態で用いられているように感光性の場合は露光の際にマスク（但し、表面実装部品用ランドの中央付近の絶縁樹脂を除去することが目的であることから表面実装部品用ランドの中央付近のみが未露光となるマスクを適用する）を用い、絶縁樹脂が感光性でない場合は、レーザ加工などの手段で表面実装部品用ランド４上の中央付近の樹脂を除去し、水洗、１３０℃、６０分間ベーキングを行い、硬化させてもよい。

【００６７】次に、３２０番から８００番程度の粗さのバフを順次用いて感光性絶縁樹脂層５０のバフ研磨を行い、少なくとも表面実装部品用ランド４が露出するまで研磨を行った。このバフ研磨処理により、図２（Ｇ）に示すように表面実装部品用ランド４の外周縁に亘ってその側面に密着された電気絶縁性ランド保持層５が形成される。尚、バフ研磨後に、上記表面実装部品用ランド４上に感光性絶縁樹脂層５０が残存していることを避けるため、過マンガン酸水溶液（過マンガン酸７０ｇ／ｌ、水酸化ナトリウム４０ｇ／ｌ）等を用い洗浄することが好ましい。

【００６８】最後に、最上配線層２２、表面実装部品用ランド４及び電気絶縁性ランド保持層５を含む全面に表面保護層６にするソルダレジストを塗布し、仮乾燥した後、露光・現像を行い、表面実装部品用ランド４に対応する部位に開口６１を有する表面保護層６を形成した。尚、表面保護層６の材料は、絶縁層に適用された同質のものが利用できる。

【００６９】更に、アルカリ脱脂処理を行い、１１０ｇ／ｌの過硫酸ナトリウム水溶液で３０秒間のソフトエッチング処理を施し、かつ、５重量％の濃度の硫酸で３０秒間洗浄して図１に示されたプリント配線板を得た。

【００７０】「密着力測定試験」この実施の形態に係るプリント配線板において、表面保護層６を形成する前の幅１００μｍ、厚さ２０μｍの表面実装部品用ランド４の端にプルテスターをつなげ、剥離が始まるまで垂直（プリント配線板表面の法線方向）に５０ｍｍ／分の速度条件で引き上げた。

【００７１】但し、現実の表面実装部品用ランド４の長さ寸法は０．４～０．６ｃｍ程度と短く上記プルテスターによる測定が困難なため、この実施の形態に係る製造方法と同一の条件で幅１００μｍ、厚さ２０μｍ、長さ４ｃｍの表面実装部品用ランド４を製造し、この試験用プリント配線板についてプルテスターによる測定を行っ

た（以下の従来法で製造したプリント配線板並びに他の実施の形態に係るプリント配線板についても同様）。この結果、約５．５ｇ～６．０ｇの力で表面実装部品用ランド４の剥離が開始した。

【００７２】次に、従来法で製造したプリント配線板（すなわち、表面実装部品用ランド４の周囲に電気絶縁性ランド保持層５が設けられていない構造のもの）の表面実装部品用ランドについても同様の方法でその密着力を測定した。この結果、上記表面実装部品用ランドは約３．５ｇ～４．０ｇの力でその剥離が開始した。

【００７３】この結果から分かるように、本発明に係るプリント配線板の表面実装部品用ランドは、従来例に係る表面実装部品用ランドに較べて極めてその密着力が大きく、剥落し難いことが確認できた。

【００７４】［第二実施の形態］この実施の形態に係るプリント配線板は、図３に示すようにガラス－エポキシから成る厚さ１ｍｍの電気絶縁性基板１と、この基板１上に設けられその膜厚が１８μｍの銅箔から成る第一配線層２１と、この第一配線層２１上に設けられた膜厚４０μｍの絶縁層３と、この絶縁層３上に設けられた銅メッキ製の最上配線層２２及び表面実装部品用ランド４と、この表面実装部品用ランド４の外周縁に亘ってその側面に密着させて設けられた電気絶縁性ランド保持層５と、上記最上配線層２２の表面を被覆しかつ表面実装部品用ランド４に対応した部位に開口６１を有する表面保護層６とでその主要部が構成されており、上記絶縁層３に設けられたバイアーホール３１を介して第一配線層２１と最上配線層２２、及び、第一配線層２１と表面実装部品用ランド４とがそれぞれ接続されていると共に、電気絶縁性ランド保持層５の上面が表面実装部品用ランド４の上面より若干上方側へ突出するように設けられている。また、第一配線層２１、最上配線層２２及び表面実装部品用ランド４については黒化処理と微細表面化処理の表面処理が施されそれぞれの表面には処理層１０が形成されている。

【００７５】そして、このプリント配線板は次の工程を経て製造されたものである。

【００７６】「第一配線層２１の形成工程」と「絶縁層３の形成工程」

第一実施の形態と同一の工程であるので記載を省略する。

【００７７】「最上配線層２２と表面実装部品用ランド４の形成工程」まず、絶縁層３が形成された全面に無電解メッキ法により厚さ約２μｍの銅メッキ層（導電層）を形成し、更に、電解メッキ法により上記銅メッキ層（導電層）上に厚さ約２０μｍの電解銅メッキ層を形成した。

【００７８】次に、この電解銅メッキ層上に感光性レジスト［東京応化工業（株）製　商品名；ＰＭＥＲ］を塗布した。次に、この感光性レジストにフォトマスクを重ね、部分的に露光・現像して上記感光性レジストを部分的に除去した。尚、残存した感光性レジストは最上配線層２２と表面実装部品用ランド４と略同一のパターン形状を有している。

【００７９】そして、この感光性レジストから露出する電解銅メッキ層をエッチングして図４（Ａ）に示すように最上配線層２２と表面実装部品用ランド４を形成し、かつ、形成されたこれら最上配線層２２と表面実装部品用ランド４上の感光性レジストｒを残したままの状態で第一実施の形態と同一の条件で最上配線層２２と表面実装部品用ランド４の黒化処理と微細表面化処理を施し、上記感光性レジストｒで被覆されていない部位に処理層１０を形成した（図４Ｂ参照）。

【００８０】「電気絶縁性ランド保持層５の形成工程」次に、黒化処理と微細表面化処理が施されかつ上面に感光性レジストｒが残されたままの最上配線層２２と表面実装部品用ランド４を含む全面に、感光性絶縁樹脂［日本ペイント（株）製　商品名：プロビコート５０００］をスクリーン印刷法により塗布し、感光性絶縁樹脂層５０を形成し、９０℃、３０分間の条件でプリベークした後、１５００ｍＪ／ｃｍ² の露光量で全面露光を行った。水洗後、１３０℃、６０分間ベーキングして硬化させた（図４Ｃ参照）。ここで、上記絶縁樹脂がこの実施の形態で用いられているように感光性の場合は、上述したように露光の際にマスクを用いて表面実装部品用ランド４上の樹脂を除去し、水洗、１３０℃、６０分間ベーキングを行い、硬化させてもよい。

【００８１】次に、３２０番から８００番程度の粗さのバフを順次用いて感光性絶縁樹脂層５０のバフ研磨を行い、少なくとも表面実装部品用ランド４上の感光性レジストｒが露出するまで研磨を行った。このバフ研磨処理により、図４（Ｄ）に示すように表面実装部品用ランド４の外周縁に亘ってその側面に密着された電気絶縁性ランド保持層５が形成される。そしてバフ研磨後に、上記表面実装部品用ランド４や最上配線層２２上に残留する感光性レジストｒを除去してこれらの表面を露出させた（図４Ｅ参照）。

【００８２】最後に、最上配線層２２、表面実装部品用ランド４及び電気絶縁性ランド保持層５を含む全面に表面保護層６にするソルダレジストを塗布し、仮乾燥した後、露光・現像を行い、表面実装部品用ランド４に対応する部位に開口６１を有する表面保護層６を形成した。尚、表面保護層６の材料は絶縁層に適用された同質のもの、あるいは異なった材料でも利用できる。

【００８３】更に、アルカリ脱脂処理を行い、１１０ｇ／ｌの過硫酸ナトリウム水溶液で３０秒間のソフトエッチング処理を施し、かつ、５重量%の濃度の硫酸で３０秒間洗浄して図３に示されたプリント配線板を得た。

【００８４】「密着力測定試験」この実施の形態に係るプリント配線板において、表面保護層６を形成する前の

幅１００μmの表面実装部品用ランド４の端にプルテスターをつなげ、剥離が始まるまで垂直（プリント配線板表面の法線方向）に引き上げてその密着力測定試験を行ったところ、第一実施の形態に係るプリント配線板と同等の強度を有していた。

［第三実施の形態］この実施の形態に係るプリント配線板は、図５に示すようにガラス－エポキシから成る厚さ１mmの電気絶縁性基板１と、この基板１上に設けられその膜厚が１８μmの銅箔から成る第一配線層２１と、この第一配線層２１上に設けられた膜厚４０μmの絶縁層３と、この絶縁層３上に設けられた銅メッキ製の最上配線層２２及び表面実装部品用ランド４と、この表面実装部品用ランド４の外周縁に亘ってその側面に密着させて設けられた電気絶縁性ランド保持層５と、上記最上配線層２２の表面を被覆しかつ表面実装部品用ランド４に対応した部位に開口６１を有する表面保護層６とでその主要部が構成されており、上記絶縁層３に設けられたバイアーホール３１を介して第一配線層２１と最上配線層２２、及び、第一配線層２１と表面実装部品用ランド４とがそれぞれ接続されていると共に、電気絶縁性ランド保持層５の上面が表面実装部品用ランド４の上面より上方側へ突出するように設けられている。また、第一配線層２１、最上配線層２２及び表面実装部品用ランド４については黒化処理と微細表面化処理の表面処理が施されそれぞれの表面には処理層１０が形成されている。

【００８５】そして、このプリント配線板は次の工程を経て製造されたものである。

【００８６】「第一配線層２１の形成工程」と「絶縁層３の形成工程」及び、「最上配線層２２と表面実装部品用ランド４の形成工程」

第一実施の形態と同一の工程であるので記載を省略する。

【００８７】「電気絶縁性ランド保持層５の形成工程」黒化処理と微細表面化処理が施された最上配線層２２と表面実装部品用ランド４（図６Ａ参照）を含む全面に感光性レジスト［東京応化工業（株）製　商品名：ＰＭＥＲ］を塗布し、かつ、この感光性レジストにフォトマスクを重ね、部分的に露光・現像して表面実装部品用ランド４上にのみレジスト層ｒを形成した（図６Ｂ参照）。尚、このレジスト層ｒは表面実装部品用ランド４の面積より少し大きめに形成することが好ましい。これは、後の工程でこのレジスト層ｒを介し上記表面実装部品用ランド４上に感光性絶縁樹脂層を形成するが、製造工程上の誤差が生じてもレジスト層ｒを大きめに形成しておくことにより感光性絶縁樹脂層を除去する場合にその残留を回避できるからである。

【００８８】次に、これらの全面に、図６（Ｃ）に示すように感光性絶縁樹脂［日本ペイント（株）製　商品名：プロビコート５０００］をスクリーン印刷法により塗布し、感光性絶縁樹脂層５０を形成し、９０℃、３０分間の条件でプリベークした後、１５００mＪ／ｃm²の露光量で全面露光を行った。水洗後、１３０℃、６０分間ベーキングして硬化させた（図４Ｃ参照）。

【００８９】次に、３２０番から８００番程度の粗さのバフを順次用いて感光性絶縁樹脂層５０のバフ研磨を行い、少なくとも表面実装部品用ランド４上のレジスト層ｒが露出する程度まで研磨を行った。このバフ研磨処理により、図６（Ｄ）に示すように表面実装部品用ランド４の外周縁に亘ってその側面に密着された電気絶縁性ランド保持層５が形成される。そしてバフ研磨後に、上記表面実装部品用ランド４上に残留するレジスト層ｒを除去して表面実装部品用ランド４の表面を露出させた（図６Ｅ参照）。

【００９０】最後に、最上配線層２２、表面実装部品用ランド４及び電気絶縁性ランド保持層５を含む全面に表面保護層６にするソルダレジストを塗布し、仮乾燥した後、露光・現像を行い、表面実装部品用ランド４に対応する部位に開口６１を有する表面保護層６を形成した。

【００９１】更に、アルカリ脱脂処理を行い、１１０ｇ／ｌの過硫酸ナトリウム水溶液で３０秒間のソフトエッチング処理を施し、かつ、５重量%の濃度の硫酸で３０秒間洗浄して図３に示されたプリント配線板を得た。

【００９２】「密着力測定試験」この実施の形態に係るプリント配線板において、表面保護層６を形成する前の幅１００μmの表面実装部品用ランド４の端にプルテスターをつなげ、剥離が始まるまで垂直（プリント配線板表面の法線方向）に引き上げてその密着力測定試験を行ったところ、第一実施の形態に係るプリント配線板と同等の強度を有していた。

【００９３】

【発明の効果】請求項１記載の発明に係るプリント配線板によれば、電気絶縁性ランド保持層の上面が表面実装部品用ランドの上面と略同一平面を構成するか若しくは上記表面実装部品用ランドの上面より上方側へ突出するように設定され、上記ランド保持層の存在により表面実装部品用ランドの側面が露出していないため、何らかの原因によりプリント配線板の表面方向に沿って外力が加わった場合においても表面実装部品用ランドに外力が作用し難く、かつ、仮に外力や引上げ力が加わった場合にも表面実装部品用ランドの外周縁に亘ってその側面に密着させて設けられた上記ランド保持層の作用によりその剥離を未然に防止できる効果を有する。

【００９４】また、請求項２及び３記載の発明に係るプリント配線板によれば、表面実装部品用ランドの側面に黒化処理などの表面処理が施されていることから表面実装部品用ランドと電気絶縁性ランド保持層との間の接触面積が増大し、これにより両者の密着力が向上するため表面実装部品用ランドの剥離を更に防止できる効果を有している。

【００９５】次に、請求項４～６及び請求項９記載の発

明に係るプリント配線板の製造方法によれば、最上配線層と表面実装部品用ランドを含む全面を被覆するように設けられた電気絶縁性樹脂層の少なくとも表面実装部品用ランドに対応した部位をバフ研磨により除去しているため、表面実装部品用ランドの外周縁に亘ってその側面に密着させて設けられる電気絶縁性ランド保持層を簡便かつ確実に形成できる効果を有している。

【００９６】また、請求項７記載の発明に係るプリント配線板の製造方法によれば、最上配線層と表面実装部品用ランド上の感光性レジスト層を残留させたままその上に設けられた電気絶縁性樹脂層のバフ研磨を行っているため、残留させた感光性レジスト層の作用により最上配線層と表面実装部品用ランドの頂部側が研磨されることがなく、かつ、バフ研磨処理の後に残留する感光性レジスト層を簡単に除去することも可能である。

【００９７】従って、バフ研磨処理にも拘らず表面実装部品用ランドや最上配線層の膜厚が変動することがないため、安定した電気特性を有するプリント配線板を確実に得ることができる効果を有する。

【００９８】更に、請求項８記載の発明に係るプリント配線板の製造方法によれば、パターン化された最上配線層と表面実装部品用ランド上に残留する感光性レジスト層を除去し、レジスト層が除去された最上配線層と表面実装部品用ランドに対し表面処理を施した後、少なくとも表面実装部品用ランド上に感光性レジスト層を形成し、かつ、この感光性レジスト層が形成された表面実装部品用ランド並びに最上配線層を含む全面に電気絶縁性樹脂層を被覆して上記バフ研磨処理を施しているため、表面実装部品用ランドの頂部側が研磨されることがない効果を有する。

＊【図面の簡単な説明】

【図１】本発明の第一実施の形態に係るプリント配線板の概略構成を示す断面図。

【図２】図２（Ａ）～（Ｇ）は第一実施の形態に係るプリント配線板の製造工程を示す説明図。

【図３】本発明の第二実施の形態に係るプリント配線板の概略構成を示す断面図。

【図４】図４（Ａ）～（Ｅ）は第二実施の形態に係るプリント配線板の製造工程を示す説明図。

【図５】本発明の第三実施の形態に係るプリント配線板の概略構成を示す断面図。

【図６】図６（Ａ）～（Ｅ）は第三実施の形態に係るプリント配線板の製造工程を示す説明図。

【図７】図７（Ａ）～（Ｄ）はフルアディティブ法による従来のプリント配線板の製造工程を示す説明図。

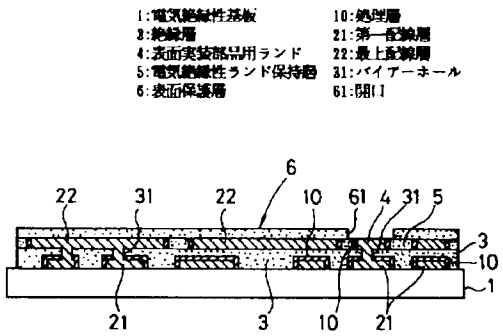
【図８】図８（Ａ）～（Ｇ）はセミアディティブ法による従来のプリント配線板の製造工程を示す説明図。

【図９】図９（Ａ）～（Ｆ）はサブトラクティブ法による従来のプリント配線板の製造工程を示す説明図。

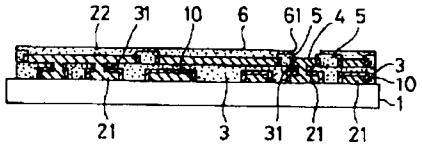
【符号の説明】

１　電気絶縁性基板
３　絶縁層
４　表面実装部品用ランド
５　電気絶縁性ランド保持層
６　表面保護層
１０　処理層
２１　第一配線層
２２　最上配線層
３１　バイアーホール
６１　開口

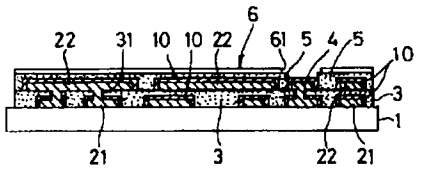
【図１】



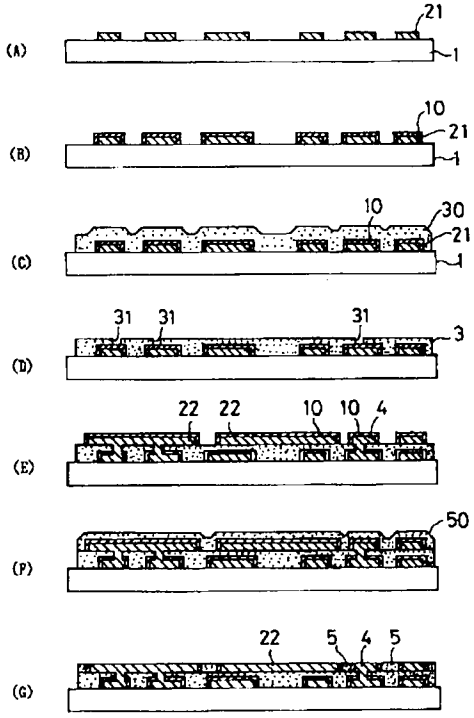
【図３】



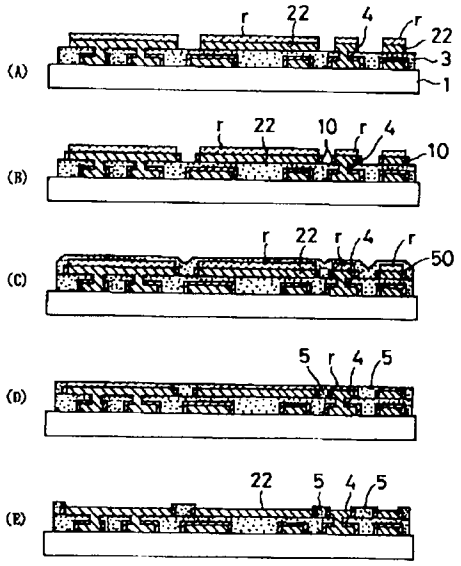
【図５】



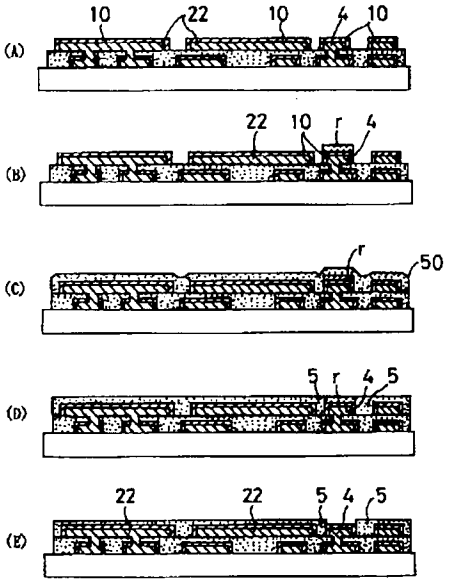
【図２】


(A)
21
1
(B)
10
21
1
(C)
10
30
21
1
(D)
31
31
31
3
(E)
22
22
10
10
4
(F)
50
(G)
22
5
4
5

【図４】


(A)
r
22
4
r
22
3
1
(B)
r
22
10
r
4
10
(C)
r
22
r
4
r
50
(D)
5
r
4
5
(E)
22
5
4
5

【図６】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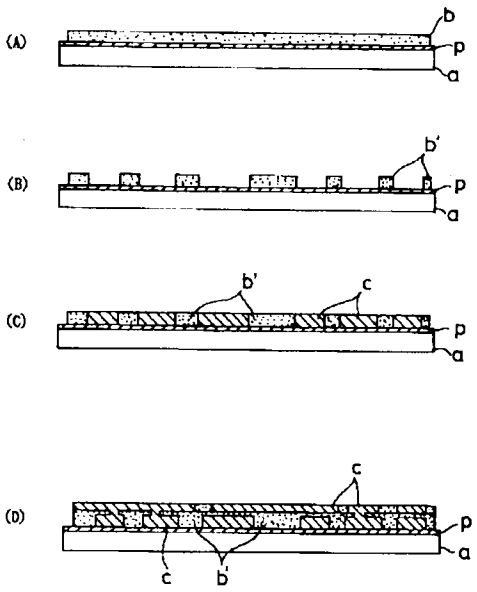
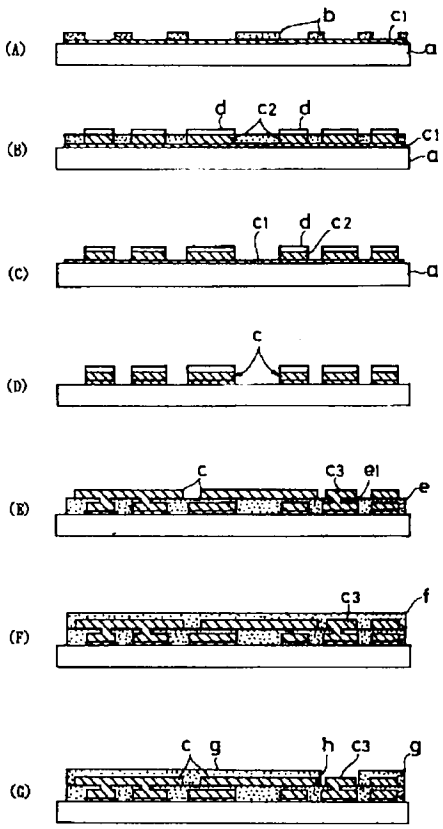
10
22
10
4
10
(B)
22
10
r
4
(C)
r
50
(D)
5
r
4
5
(E)
22
22
5
4
5

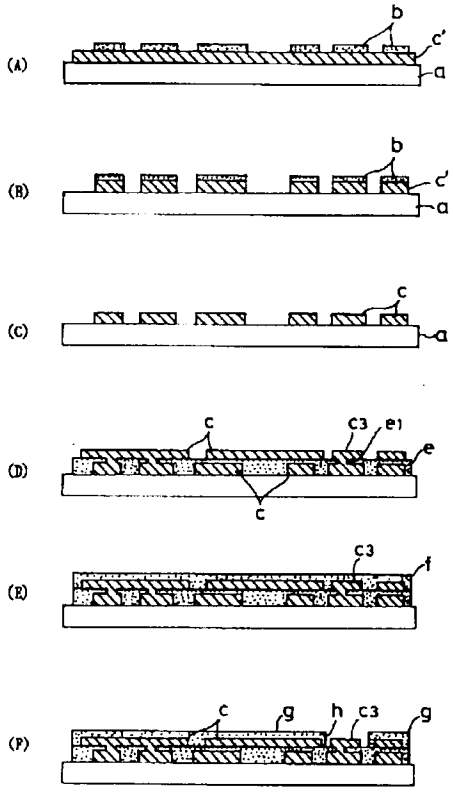
【図７】


(A)
b
p
a
(B)
b'
p
a
(C)
b'
c
p
a
(D)
c
p
a
c
b'

【図８】


(A)
b
c1
a
(B)
d
c2
d
c1
a
(C)
c1
d
c2
a
(D)
c
(E)
c
c3
e1
e
(F)
c3
f
(G)
c
g
h
c3
g

【図９】


(A)
b
c'
a
(B)
b
c'
a
(C)
c
a
(D)
c
c3
e1
e
c
(E)
c3
f
(F)
c
g
h
c3
g